Appendix P – Biological Evaluation and Assessment

Biological Evaluation and Assessment for Listed and Sensitive Species

STEELHEAD TROUT (*Oncorhynchus mykiss gairdneri)*

REDBAND TROUT (*Oncorhynchus mykiss gairdneri)*

BULL TROUT *(Salvelinus confluentus)*

FALL CHINOOK SALMON *(Oncorhynchus tschawytscha)*

SPRING CHINOOK SALMON *(Oncorhynchus tschawytscha)*

WESTSLOPE CUTTHROAT TROUT *(Oncorhynchus clarki lewisi)*

LAMPREY *(Lampetra tridentata)*

American and Crooked River Project
Red River Ranger District
Nez Perce National Forest

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Introduction

This BA/BE tiers to the Nez Perce Forest Plan and EIS (1987) and the South Fork Clearwater River Biological Assessment (April 1999). It incorporates information from the Interior Columbia River Basin Science Assessment (Quigley, et al., 1997), the South Fork Clearwater River Landscape Assessment (SFLA) (1998), and the Final American and Crooked River Environmental Impact Statement (ARCR FEIS) (2005) including references.

This biological evaluation/assessment has been prepared to address the potential effects of the preferred alternative D as described here and in the Final Environmental Impact Statement for the American and Crooked River (FEIS) on fall chinook salmon, spring chinook salmon, steelhead trout, bull trout, westslope cutthroat trout, redband trout and lamprey. Fall chinook salmon are listed as threatened under the Endangered Species Act (ESA). Spring chinook salmon are listed as threatened in the Salmon River basin, and are a Region 1 Forest Service sensitive species in the Clearwater basin. Steelhead/redband trout are listed as threatened under the ESA. Columbia River bull trout are listed as threatened under the ESA. Westslope cutthroat trout, lamprey, and redband trout, are Region 1 sensitive species.

The analysis of effects of activities on listed and sensitive fish as described below is based on indicators for listed steelhead/redband and bull trout, as described in the Checklist for Documenting Environmental Baseline and effects of Action(s) on Relevant Indicators (i.e. steelhead/bull trout matrix of indicators) as modified by the Nez Perce/Clearwater/Bitterroot National Forests and Cottonwood Bureau of Land Management Level 1 team. Also considered are the nine primary constituent elements identified in the Federal Register (11/29/02, pg. 17, 243) for bull trout proposed critical habitat. The environmental baseline used for analysis is taken from the South Fork Clearwater River Biological Assessment (Nez Perce N.F., 1999). Consideration was given to activities, post 1999, in Crooked River and American River and the South Fork Clearwater as they related to the baseline, including past ESA consultations in the sub-basin. No changes or modifications were required in the Matrix of Indicators or in the baseline conditions.

The activities described below fall completely within the South Fork Clearwater River subbasin. Tributaries within the South Fork potentially affected include American River and tributaries and Crooked River and tributaries as well as face drainages to the South Fork Clearwater River.

This document has been prepared in compliance with Section 7 of the Endangered Species Act of 1973 (as amended), 50 CFR 402.12, CFR 219.9 of the NFMA regulations, and Chapter 2670 of the Forest Service Manual. Reference Forest wide species list SP# 1-4-05-SP-120, dated December 8, 2004.

For further information, refer to Hydrologic Unit Code (HUC) Biological Assessment (BAs) for listed and sensitive aquatic species (4th along with 5th and 6th code HUC BAs) for portions (watersheds) of the sub basins (USDA-USDI 1999, USDI-BLM 2000A, B, C, D, and E).

This biological assessment has modified the Biological Evaluation and Assessment for the American and Crooked River Project, (October 14, 2004). Project activities have changed since the original BE/BA (October 14, 2004) and a new updated species list from the Fish and Wildlife Service (December, 8, 2004) has modified proposed critical habitat, excluding Federal portions of American River and Crooked River. Some of the project activities were also modified showing changes in the original analysis. While the instream improvements detailed in the original BE/BA called for up to 23.8 miles of this type of work to be accomplished, it was discovered that this number reflected an accounting error where stream reaches receiving riparian planting and more extensive stream restoration like in Lower Crooked River and Relief Creek, were actually double counted. This BA/BE shows instream activities actually planned for up to 14.6 miles. While this may seem like a reduction in miles of instream improvements, it is actually the same exact project simply eliminating the double counting of some stream reaches.

This biological assessment must be modified and consultation reinitiated following concurrence by the NMFS and USFWS, if:

1. Activities other than those described under the Project Description section of this document are implemented;
2. New information relevant to this analysis, which would significantly alter the effects as predicted, becomes available;
3. Required mitigation is not implemented;
4. A new species is listed or critical habitat not addressed in this document is designated;
5. The environmental baseline of the mainstem South Fork Clearwater River or tributaries described in this document significantly change from human or natural disturbances, such as extreme wildfire or floods;
6. During implementation of the project, effects to watersheds, streams, or fish occur which are not comparable to effects analyzed in this Biological Assessment;
7. The duration of the project extends beyond ten years, or;
8. The project affects listed species to an extent not considered in this BA.

Action Area Location

The action area (50 CFR Sec. 402.02) includes two 5th code watersheds, American River and Crooked River. American River contains fifteen 6th code sub watersheds (also known as prescription watersheds). Project activities are located in nine of the fifteen 6th code sub watersheds in American River. Crooked River contains five 6th code sub watersheds. Project activities are located in four of the five sub watersheds in Crooked River. The action area for cumulative effects analysis includes the American and Crooked River watersheds and the mainstem South Fork Clearwater River to the Forest Boundary below the Mt. Idaho Bridge.

The Decision

The project will implement the preferred Alternative D of the American-Crooked River Project, with modifications including additional watershed improvements from Alternative E; this became the Selected Alternative, described below.

Vegetation Treatments

Up to 3,452 acres of timber harvest will occur. Appendix H of the Final EIS describes in detail all of the treatment types by unit for each action alternative. The selected alternative includes all of the units in preferred Alternative D, with the following exceptions. During additional analysis between the Draft and Final EIS, Units 99, 99.2, 105, and 329 (about 62 acres) were identified as meeting the Forest Plan criteria for old-growth. These units were dropped from consideration for harvest. Units 541.542 and 543 were added to American River (112 acres).

Of the planned harvest acres, about 35 percent will be clearcut, and the remaining acres will be partially cut or thinned. Harvest methods include ground-based tractor (52 percent of the project acres) and cable systems (34 percent); the remaining acres (14 percent) are anticipated to be roadside salvage. The total harvest is estimated to produce 25.4 million board feet (MMBF) of timber.

The transportation system proposed in Alternative D was adopted, with minor modifications, for the selected alternative. To facilitate timber harvest activities, an estimated 14.3 miles of temporary roads will be constructed. Each of these temporary roads will exist on the landscape for one to three years and will be decommissioned following timber harvest activities.

In addition to temporary roads, the selected alternative will require a combination of annual and deferred maintenance to prepare existing classified roads for timber haul. Road reconditioning will be required on about 89.6 miles of road. Of this roadwork, approximately 7.4 will be decommissioned after use and the remaining 82.1 miles will be maintained as part of the long-term transportation system for the analysis area. Table 2 (Table R-2 in the EIS) and Map 4a and 4b (FEIS) display the road reconditioning and temporary road construction needed to facilitate timber removal.

TABLE 1. VEGETATION TREATMENT ACTIVITIES WITH THE SELECTED ALTERNATIVE

Proposed Activity – Total Project		Alt D
Acres of Treatment	Tractor Yard/Machine Pile	1813
	Cable Yard/Broadcast Burn	1173
	Roadside Salvage	466
	Total Acres Treated	3452
	Percent Clearcut	34%
	Percent Partial Cut/Thin	66%
Temporary road construction (miles)[1]		14.3
Road reconditioning (for timber harvest) (miles)[2]		89.6

WATERSHED IMPROVEMENTS

The watershed improvements proposed for Alternative D, as modified by the Record of Decision, were adopted for the selected alternative. These actions are discussed below and summarized in Appendix A. Additional details are also provided in Appendix A.

A minimum of 19.0 miles of road will be eliminated from the transportation system through a variety of decommissioning methods. This road decommissioning is required as mitigation for the planned timber harvest in order to meet watershed objectives, and will be accomplished within 7-10 years of this decision. In areas where a road proposed for decommissioning is

[1] Temporary roads will be decommissioned within one to three years of construction.

[2] Road reconditioning covers a range of activities, such as surface blading, drainage repair, and roadway brushing with occasional culvert installations, slump repairs, and stabilization work. Road widening could occur with major reconstruction. Road reconditioning stated in this table are not to be considered or confused with routine road maintenance that may include but not limited to road prism brushing, clearing, or hazard reduction activities.

needed for timber harvest activities, the timber harvest activities will occur prior to the decommissioning.

Also included as part of the selected alternative, are the additional watershed improvements that were identified in Alternative E (displayed in Appendix A). These additional actions are not required as mitigation for the proposed timber harvest activities and are discretionary; they may be implemented as additional funds become available.

TABLE 2. WATERSHED IMPROVEMENTS WITH THE SELECTED ALTERNATIVE

Proposed Activity – Total Project	Required	Total Additional
Miles of decommissioned roads[1]	18.9	37
Miles of Watershed Road Improvements	16.6	24.6
Number of sites of Watershed Road Improvements	3	3
Stream crossing improvements[2]	13	35
Miles of instream improvements	11.1	14.6
Miles of Recreation and Trail improvements	2.3	4.6
Acres of Recreation and Trail improvements	8.1	8.1
Access change for vehicle use - motorized trail use (ATV) to restricted use (miles)[3]	1.0	1.0
Acres of Mine Site Reclamation	7	9
Acres of Soil Restoration	32	58

Summary of the Proposal by Watershed

The activities will be scheduled and implemented so that a balance will be achieved between vegetation and watershed improvement activities. The life of a typical timber sale contract is 7-10 years and all required activities would be completed in this time frame. There are three types of restoration activities 1) those road related activities and riparian plantings that can be completed separate from timber sale actions 2) road related activities that are needed for the timber sale activities and 3) Instream restoration projects which will require planning, designs, permits and additional funding. Type 1 activities will proceed once this decision is final and can be completed in advance or concurrent of the timber sale actions. Type 2 activities must be scheduled with the timber sale actions and coordinated in a way that will not impede either. These could continue through the life of the sale(s). The in channel work (Type 3) requires planning, design work and permitting, all of which take time. Implementation of this work will occur within the timeframe of the timber sale contract.

Table 3: American River Watershed, and Table 4: Crooked River Watershed displays the activities for the proposed action. Activities included under Alternative D modified are included for consideration under this BA/BE. The tables below include miles road reconditioning and miles of watershed road improvement. Road improvement miles include activities designed to

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[1] Road decommissioning for this project covers a range of activities, from recontouring to abandonment due to grown-in conditions. It includes 7.4 miles of roads to be used for timber harvest and decommissioned upon completion of harvest activities. See Appendix F in the Final EIS.

[2] Stream crossing improvements include upgrading or improving culverts and bridges to improve fish passage and peak water flows and are listed as the number of sites.

[3] This is an access change, which restricts use to two wheeled vehicles or snowmobiles over snow, from previous all terrain vehicle use (ATV).

make the road usable for logging traffic. Activities would include blading, adding relief culverts, cleaning ditches, brushing etc. on roads that are mostly already stable. Miles of Watershed Road Improvement include similar activities but the road conditions will improve from a watershed perspective. The items listed under "Alt D modified additional", are included for analysis and consultation under this BE/BA. They are shown as additional and as such will be completed when and if funding becomes available. The items listed under "required" will be completed under this action.

TABLE 3. ACTIVITIES IN THE AMERICAN RIVER WATERSHED.

Proposed Activity - American River		Alt D modified required	Alt D modified additional
Acres of Treatment	Tractor Yard/Machine Pile	841	
	Cable Yard/Broadcast Burn	239	
	Roadside Salvage	137	
	Total Acres Treated	**1,217**	
	Percent Clearcut	29%	
	Percent Partial Cut/Thin	71%	
Miles temporary road construction[1]		8.1	
Miles road reconditioning[2]		33.9	
Miles of decommissioned roads[3]		8.4	11.0
Miles of Watershed Road Improvement		7.4	
Number of sites of Watershed Road Improvement		0	
Stream crossing improvements[4]		3.0	6.0
Miles of instream improvements		0	
Miles of Recreation and Trail improvements		1.6	0.8
Acres of Recreation & Trail improvements		0	
Acres of Mine Site Reclamation		0	
Acres of Soil Restoration		9.0	12.0
Access change for vehicle use - motorized trail use (ATV) to restricted use (snowmobiles over snow)[5]		1.6	
Access change for vehicle use – road to trail[6]		0	

[1] Temporary roads would be decommissioned within one to three years of construction.

[2] Road reconditioning covers a range of activities, such as surface blading, drainage repair, and roadway brushing with occasional culvert installations, slump repairs, and stabilization work. Road reconditioning stated in this table are not to be considered or confused with routine road maintenance that may include but not limited to road prism brushing, clearing, or hazard reduction activities.

[3] Road decommissioning for this project covers a range of activities, from recontouring to abandonment due to grown in conditions. See Appendix F

[4] Stream crossing improvements include upgrading or improving culverts and bridges to improve fish passage and peak water flows and are listed as the number of sites.

[5] This is an access change, which restricts use to two wheeled vehicles or snowmobiles over snow, from previous all terrain vehicle use (ATV).

[6] This is an access change of miles of roads to trails use.

TABLE 4. ALTERNATIVES IN THE CROOKED RIVER WATERSHED.

Proposed Activity - American River		Alt D modified required	Alt D modified additional
Acres of Treatment	Tractor Yard/Machine Pile	975	
	Cable Yard/Broadcast Burn	931	
	Roadside Salvage	329	
	Total Acres Treated	**2,235**	
	Percent Clearcut	36%	
	Percent Partial Cut/Thin	64%	
Miles temporary road construction[1]		6.2	
Miles road reconditioning[2]		56.6	
Miles of decommissioned roads[3]		10.5	7.0
Miles of Watershed Road Improvement		9.2	8
Number of sites of Watershed Road Improvement		3	
Stream crossing improvements[4]		10.0	16
Miles of instream improvements		11.1	3.5
Miles of Recreation and Trail improvements		0.7	1.5
Acres of Recreation & Trail improvements		8.1	
Acres of Mine Site Reclamation		7.0	2.0
Acres of Soil Restoration		23.0	14.0
Access change for vehicle use - motorized trail use (ATV) to restricted use (snowmobiles over snow)[5]		1.0	
Access change for vehicle use – road to trail[6]		1.6	

[1] Temporary roads would be decommissioned within one to three years of construction.

[2] Road reconditioning covers a range of activities, such as surface blading, drainage repair, and roadway brushing with occasional culvert installations, slump repairs, and stabilization work. Road improvements stated in this table are not to be considered or confused with routine road maintenance that may include but not limited to road prism brushing, clearing, or hazard reduction activities.

[3] Road decommissioning for this project covers a range of activities, from recontouring to abandonment due to grown in conditions. See Appendix F

[4] Stream crossing improvements include upgrading or improving culverts and bridges to improve fish passage and peak water flows and are listed as the number of sites.

[5] This is an access change, which restricts use to two wheeled vehicles or snowmobiles over snow, from previous all terrain vehicle use (ATV).

[6] This is an access change of miles of roads to trails use.

TABLE 5. CULVERT ACTIVITIES ASSOCIATED WITH POSSIBLE TAKE IN CROOKED RIVER

STREAM NAME	CULVERT NUMBER	ROAD NUMBER	STEELHEAD	BULL TROUT	SEDIMENT PLUME DISTANCE[1]	SELECTED (YES OR NO)
RELIEF CREEK.	2234	1803	X		300’	Y
RELIEF CREEK	1964	9859	X		300’	Y
RELIEF CREEK	1907	9876	X		300’	Y
RELIEF CREEK	1926	9876	X		300’	Y
BAKER GULCH	2092	233	X	X	300’	Y
RAINBOW GULCH	2136	233	X	X	300’	Y
QUARTZ CREEK	2340	233A	X	X	300’	Y
QUARTZ CREEK	2341	233A	X	X	300’	Y
SAWMILL CREEK	2205	9836	N/A	N/A	N/A	Y
SILVER CREEK	2285	9836B	X	X	300’	Y
CROOKED RIVER	2371	9848	X	X	300’	Y

TABLE 6. INSTREAM AND CULVERT ACTIVITIES ASSOCIATED WITH POSSIBLE TAKE IN CROOKED RIVER

STREAM NAME	NUMBER OF STRUCTURES	STEELHEAD (TOTAL AGE 1/2+ ESTIMATED)[2]	BULL TROUT (TOTAL ESTIMATED)[2]	SEDIMENT PLUME DISTANCE[2]	SELECTED (YES OR NO)
LOWER CROOKED RIVER	40	2740	35	300’	Y
RELIEF CREEK	40	[3].22/100M^2	[2].04/100M^2	300’	Y
CROOKED RIVER NARROWS	6	1808	22	300’	Y
MIDDLE CROOKED RIVER	50	1449	24	300’	Y

[1] Distance is a measure of stream gradient, size, and amount of disturbance or excavation.

[2] Distance is a measure of stream gradient, size, and amount of disturbance or excavation.

[3] Fish density from Clearwater BioStudies, (1990); Fish Density from Idaho Department of Fish and Game Bull Trout Study SFCR (1999)

TABLE 7. PROJECT DESIGN AND MITIGATION MEASURES FOR THE AMERICAN AND CROOKED RIVER PROJECT

Design and mitigation measures would apply to all actions. Forest Plan standards and other Agency direction, along with information derived from monitoring past projects, were used to identify design and mitigation measures applicable to the action. Mitigation measures are practices used during implementation of the activities.

#	PROJECT DESIGN AND MITIGATION MEASURE	IMPLEMENTATION METHOD	EFFECTIVENESS
AREAS EXCLUDED FROM TIMBER HARVEST OR FUEL REDUCTION ACTIVITIES			
1	No timber harvest or mechanical fuel reduction activities would occur in Forest Plan allocated existing or replacement old growth, Inventoried Roadless Areas, streamside RHCAs, or high hazard landslide prone areas	NEPA project design, silviculture prescription, and field prep.	High, based on available inventory and monitoring data
VEGETATION			
2	Falling would be done to minimize breakage and damage to residual trees.	Field preparation, contract and contract administration/ inspection	High, based on sale administrators' observations
3	Silvicultural prescriptions would be written for each unit, including slash treatment and burn guidelines to meet Riparian Management Objectives	Silvicultural prescription	High, based on protocols for silvicultural certification
RIPARIAN HABITAT CONSERVATION AREAS			
4	No cutting of trees would be allowed in PACFISH default streamside or wetland RHCAs, except at temporary road crossings, instream habitat improvements, and to facilitate anchoring of cable yarding systems.	Field preparation, contract and contract administration/inspection	High, based on inventory and monitoring data
5	Post harvest burning will occur in harvest units to reduce slash and fuel resulting from the harvest activities. The burning will be designed and implemented with the intent of restricting burning to stay within the unit boundary. Fire that moves outside the external unit boundary will be sup-pressed. On occasion fire will move into small RHCA inclusions within the unit. Burning will not be ignited within these areas, but may be allowed to back into these areas under conditions where fire intensity will be low and burning will not result in extensive reduction in canopy cover or exposure of bare soil in these RHCA inclusions.	FS Fuels management	High, based on Research, PNW Lab, Starkey Project
6	Landslide prone areas are also considered Riparian Habitat Conservation Areas (RHCAs). No timber harvest would occur in	NEPA project design, silviculture prescription, and field prep.	High, based on landslide inventory data

#	PROJECT DESIGN AND MITIGATION MEASURE	IMPLEMENTATION METHOD	EFFECTIVENESS
	areas of high landslide hazard, as described in (1) above. Timber harvest, road construction, or fuel reduction in areas of moderate landslide risk would be modified as needed to protect slope stability. If additional, unmapped landslide prone areas are found during project implementation, areas would be dropped or activities would be modified with watershed specialist oversight to protect slope stability.		
	SOILS, WATER QUALITY, AND FISH HABITAT		
7	Planned activities would be modified in any proposed timber harvest or fuel reduction unit that is found to have previously unidentified significant soil impacts from past human-caused disturbance. The planned activities in that unit would be modified or dropped to ensure that cumulative impacts would not exceed Forest Plan soil quality standard number 2 (percent of area detrimentally impacted upon completion of activities). Site-specific review of treatment units prior to implementation would identify extent of detrimental soil disturbance.	NEPA project design, silviculture prescription, and field prep.	Moderate, based on research and forest monitoring data (Cullen et al., 1991, Froelich et al., 1983, USDA FS 1988b, 1990, 1992, 1999, and 2003D).
8	Timber harvest or fuel reduction activities would be coordinated with soil restoration activities for greatest efficiency.	Contract administration	Expected to be moderate, little data.
9	Broadcast burning would be applied in preference to excavator piling wherever practical to reduce physical soil damage and to encourage natural regeneration.	NEPA project design, silviculture prescription, and contract.	High, to the degree implemented; based on forest monitoring data (USDA FS 1988b,1990, 1992, 999, and 2003D).
10	Temporary roads would be built, used, and decommissioned within a 1 to 3-year period, in order to reduce the amount of sediment production. Coordination of temporary road use and decommissioning with the BLM Eastside Township project would be required.	NEPA project design and contract administration	Moderate, based on implementation monitoring of timber sale contracts and Burroughs and King, 1989.
11	New, temporary roads would be constructed using minimal road widths and out-sloped surface drainage. Road cuts, fills, and treads would be stabilized with annual grass cover where roads are held more than one year. Temporary roads would be located to avoid live water and high-risk landslide prone terrain. If avoidance of live water is not possible, stream crossings would be	Contract and contract administration/inspection	High, based on literature (Water/Road Interaction Technology Series, USDA Forest Service, San Dimas Technology and Development Program, 1999; Burroughs and King,

#	Project Design and Mitigation Measure	Implementation Method	Effectiveness
	designed consistent with criteria described below and in Forest Plan Amendment 20 (PACFISH)		1989)
12	Coarse woody debris greater than 3 inches diameter would be retained in timber harvest or fuel reduction units in amounts to meet guidelines in Appendix K.	NEPA project design, silviculture prescription, contract, and contract administration.	High effectiveness, based on Graham et al., 1994 and Harvey et al. 1987. Implementation effectiveness has not been monitored.
13	Minimize whole tree yarding. Whole-tree yard boles only, leave tops and limbs on site to main-tain foliar nutrients. Over-winter slash at least one winter to allow nutrients to leach into the soil.	NEPA project design, silviculture prescription, BD plan, and contract.	High (Garrison and Moore, 1998; Moore et al., 2004)
14	Winter harvesting would only occur during frozen conditions. Frozen conditions are defined as greater than 4 inches of frozen ground, a barrier of snow greater than two feet in depth (unpacked snow), or one foot in depth (packed snow).	Contract administration	Moderate, based on forest monitoring data (1987 report in project file)
15	Timber harvest, fuel reduction, and soil and stream restoration activities would be limited when soils are wet, such that resource damage may occur, to reduce rutting, displacement and erosion.	Contract and contract administration/inspection	Moderate, based on forest monitoring (USDA FS 1988b, 1990, 1992, 1999, and 2003D).
16	Skid trails, landings, and yarding corridors would be located and designated to minimize the area of detrimental soil effects. Tractor skid trails would be spaced 80 to 120 feet apart, except where converging on landings, to reduce the area of detrimental soil disturbance. This does not preclude the use of feller bunchers if soil impacts can remain within standards.	Contract and contract administration/inspection	Moderate, based on forest monitoring (USDA FS 1988b, 1990, 1992, 1999, and 2003D).
17	On excavator piled units, additional trail construction would be minimized, machines would be restricted to existing trails as much as possible, number of passes would be minimized, and excavator piling would be minimized, to reduce soil compaction. Numerous small piles are preferred to few large piles to avoid nutrient losses and soil alteration that favor weed invasion.	Contract and contract administration/inspection	Moderate, based on forest monitoring (USDA FS 1988b, 1990, 1992, 1999, and 2003D).
18	Cable systems would use one-end or full suspension wherever possible to minimize soil disturbance.	Contract and contract administration/inspection	High where implemented (USDA FS 2003a; Krag, 1991)
19	Excavated skid trails and landings with cut	Contract and contract	High (Plotnikoff et al.,

#	PROJECT DESIGN AND MITIGATION MEASURE	IMPLEMENTATION METHOD	EFFECTIVENESS
	slopes of more than 1 foot would be scarified and recontoured, replacing topsoil as feasible on all landings and trails not needed for harvest within the next 15 years. Winged subsoiler, excavator, or similar equipment is preferred to restore permeability and soil structure.	administration/inspection	1999; Sanborn et al. 1999A, Sanborn et al., 1999B)
20	Fine organic matter and slash would be scattered over recontoured and decompacted areas on skid trails and landings with a goal of achieving 10 tons per acre of fines and 15-20 tons per acre of larger material, up to 35 tons total where acceptable to fuel managers. Water bars and seeding of approved weed-free annual or native species would be added as needed for supplementary erosion control.	Contract and contract administration/inspection	High (Sanborn et al., 1999)
21	Soil restoration areas would be stabilized within 14 days, using erosion barriers, slash, or mulch as needed. Any soil restoration in an activity area would be completed within one operating season, with allowance for additional planting and subsequent seasons.	Contract and contract administration/inspection	Moderate, based on past experience.
22	Non-excavated skid trails and landings not needed for harvest within the next 15 years, that have been cut, compacted or entrenched 3 inches or more would be scarified to a depth of 4 – 10 inches, or as directed by contract administrator, to restore soil permeability. Excavator, winged subsoiler, or similar equipment is preferred, to avoid mixing surface ash layer and subsoil.	Contract and contract administration/inspection	Moderate to high (Froelich et al., 1983; Froelich et al, 1985;Foltz and mallard, 2004; Luce, 1997)
23	Sediment and erosion control measures such as dewatering culverts, sediment barriers, rocking road surfaces and/or ditches, etc., would be used as needed when constructing, reconstructing, and decommissioning roads to protect fish habitat and water quality.	Contract and contract administration	High, based on literature, San Dimas, Road/Water Interaction
24	Activities including stream crossing road improvements would be conducted in fish bearing streams between July 1 and August 15 to avoid sediment deposition on emerging steelhead or Chinook redds, or disturbance to bull trout moving to natal streams. These dates may be site-specifically adjusted through coordination with the Central Idaho Level I team and other agencies.	NEPA project design, contract and contract administration/inspection	Moderate to high, based on past experience.
25	Stream crossing structures would provide for channel width, flow velocities, substrate	NEPA project design, contract and contract	High, based on literature, San Dimas,

#	PROJECT DESIGN AND MITIGATION MEASURE	IMPLEMENTATION METHOD	EFFECTIVENESS
	condition, and stream gradients that approximate the natural channel and accommodate passage of streamflow, debris, fish, and other aquatic organisms, and would use PACFISH standards. When designing new structures, consider and give preference to open-bottom arches, bridges and oversized culverts.	administration/inspection	Road/Water Interaction
26	During instream habitat improvement activities, tree felling in RHCAs would occur only where that activity would not affect Riparian Management Objectives for shade and woody debris recruitment. Wood for instream placement would be taken from outside the RHCA wherever feasible.	Contract and contract administration/inspection	High, based on past experience.
27	Prior to instream habitat improvement activities, heavy equipment would be inspected to assure no leakage of oil, fuel, or hydraulic fluid.	Contract and contract administration/inspection	Moderate to high, based on past experience.
28	Spill Prevention Control and Countermeasures Plan (40 CFR 112) would be prepared and implemented that incorporates the rules and requirements of the Idaho Forest Practices Act Section 60, Use of Chemicals and Petroleum Products; and US Department of Transportation rules for fuels haul and temporary storage; and additional direction as applicable.	Contract and contract administration/inspection	High, based on past experience.
29	For instream activities in fish-bearing streams that contain listed species, fish are expected to disperse from the activity area. If needed, additional measures would be used to ensure fish are not harmed or killed by instream activity. If electrofishing were necessary, it would be conducted in accordance with NOAA Fisheries electrofishing guidelines found at http://www.nwr.noaa.gov.	Contract and contract administration/inspection	Moderate, based on past experience.
30	The State of Idaho Best Management Practices (BMPs) and Forest Service Soil and Water Conservation Practices (SWCPs) would be applied. These are incorporated by reference.	Contract and contract administration/inspection	High, based on past experience.
	TRAILS/RECREATION		
31	Coordination would minimize conflict with winter hauling on roads used as groomed snowmobile routes.	Project design, contract and contract administration/ inspection	Moderate, based on past experience.
32	Trails 820, 832, 838, 844, 848, and others as identified, would be protected during	Contract and contract administration/inspection	High, based on past experience.

#	PROJECT DESIGN AND MITIGATION MEASURE	IMPLEMENTATION METHOD	EFFECTIVENESS
	activities. Designate all system trails as Protected Improvements in the Timber Sale Contract. No skidding across trails, except over snow, fall trees away from trails, cut stumps less than 12" in height within 100 feet of trails, leave regeneration within 100 feet of trails to create a visual buffer between treatment areas and trails, construct firelines to protect the regeneration buffer and trail during slash treatment, and trails are not to be used a firelines.		
	ACCESS/PUBLIC SAFETY		
33	Temporary roads would be closed to public motorized use, except as specifically authorized.	Contract and contract administration/inspection	Moderate for sediment reduction and wildlife security, based on monitoring
34	Operator would be required to set up warning signs advising of equipment operations or hazards for public safety.	Contract and contract administration/inspection	High, based on past experience.
	AIR QUALITY		
35	Procedures outlined in the North Idaho Smoke Management Memorandum of Agreement would be followed, including restrictions imposed by the smoke management-monitoring unit.	FS fuels management	High, based on burning approval-required daily by smoke monitoring unit.
36	Prescribed burning would be conducted over several years to reduce the amount of smoke in any one year. Priority in scheduling would be given to units accessed by temporary roads scheduled for decommissioning	FS fuels management	High, based on past experience, and availability of burn windows and/or personnel.
37	Additional restrictions, beyond those imposed by the smoke management-monitoring unit, would be considered for prescribed burning for local air quality reasons, including visual.	FS fuels management	High, based on past experience.
	WILDLIFE		
38	Snag and snag replacement green trees would be retained in numbers consistent with Regional Guidelines (Appendix K)	Field preparation, NEPA project design, contracting and contract administration	High except where safety concerns or wood cutting result in loss.
39	Should any of the following be sighted in the project area during project implementation, the U.S. Fish & Wildlife Service and Unit biologist would be notified: lynx or a lynx den, bald eagle, new wolf den or rendezvous site, active goshawk nest. Appropriate protection measures would be implemented where deemed necessary to protect these species.	NEPA project design, silviculture prescription, field prep, contract administration/inspection, and USFWS monitoring	Moderate; based on public sightings reports and ESA section 7 consultation.
40	Should an active goshawk nest be discovered within a 450 feet distance of timber harvest or	Field prep, contract and contract administration/	Moderate; based on IDFG, et al, 1995,

#	Project Design and Mitigation Measure	Implementation Method	Effectiveness
	fuel reduction activities, the nest tree will be protected, as well as a 30 acre no-treatment buffer area around the nest tree, as designated by the unit biologist to provide for foraging and nesting sites.	inspection	State Conservation Effort
41	The integrity of existing access management restrictions would be maintained within the planning area for wildlife security purposes. Current access management restrictions would apply to existing reconstructed roads after implementation of activities to maintain or improve existing access and wildlife security. No contractor or their representatives may use motorized vehicles to hunt or trap animals on a restricted road.	Contract and contract administration/inspection	High except close to roads; based on standard timber sale contract clauses and past results monitoring .
Heritage Resources			
42	Known historic properties or sites would be avoided or protected.	NEPA project design, field prep, contract, and administration/inspection	High, objective to achieve a “no adverse effect” on these resources
43	If additional cultural resources are discovered during project operations, all ground-disturbing activities would be halted until such cultural materials can be properly documented and evaluated by the Forest Archaeologist in compliance with 36 CFR 800.	Contract and contract administration/ inspection	Moderate based on recognition of resource and contact with Heritage Personnel
Noxious Weeds			
44	Desirable vegetation would be promptly established on all disturbed areas, using native and non-native plant species, as approved by the Forest botanist.	Contract and contract administration/inspection	Moderate based on experience
45	All named plant cultivars used in revegetation will be certified blue-tagged. All non-certified seed will be tested by a certified seed laboratory against the all state noxious weed list and documentation of the seed inspection test provided to the contract administrator. All straw and mulch would be certified as free of noxious weed seed.	Contract and contract administration and inspection	High, based on experience
46	All mud, soil and plant parts would be removed from all off-road equipment associated with the project before moving into the project area to limit the spread of weeds. Cleaning must occur off National Forest lands. This applies to all ATVs used on and off roads in the project area, but does not apply to service or hauling vehicles that would stay on the roadway, traveling frequently in and out of the project area.	Contract and contract administration and inspection	High; based on past experience.

#	Project Design and Mitigation Measure	Implementation Method	Effectiveness
47	All private rock used for surfacing would be county-certified as free of noxious weed seed. Forest Service rock sources will be reviewed for invasive weeds by a forest weed specialist or botanist. Borrow pits and stockpiles will not be used if it is determined that it is infested with an invasive plant that is not found in the area where the material will be placed.	Contract and contract administration/ inspection	Moderate; based on past experience
48	All small outbreaks of invasive weeds within the project risk zones (Map 16b), and along main travel routes leading to weed risk zones will be pretreated prior to ground disturbing activities.	Field prep, contract	High: based on past experience
	TES Plants		
49	Candystick, a Region 1 sensitive plant species, occurs in some management units. Where live lodgepole are associated with candystick, groups of live lodgepole pine would be left to protect candystick from management activities.	NEPA project design, field prep, contract and contract administration/ inspection	High based on past monitoring and experience.
50	During implementation, if activities would impact previously unknown sensitive plant occurrences, appropriate protection measures would be implemented. Appropriate measures will vary depending upon the ecology of the species involved and nature of the proposed action and would be directed by a botanist.	Silvicultural prescription, field preparation, contract, and contract administration/inspection	High based on monitoring, experience, and logic.
	Roadside Salvage[1]		
51	Roadside salvage would be limited to dead or dying trees, with no harvest of standing trees more than 20 inches in diameter. (Windthrown trees would not be subject to the diameter limit.)	Contractor permit	High; based on based experience and accessibility to sites
52	Salvage would be limited to areas adjacent to haul roads. No tree cutting or yarding would occur in RHCAs or in allocated existing or replacement old growth.	Contractor permit	High; based on based experience and accessibility to sites
53	All yarding would be done from the road. Areas above steep cutslopes that cannot be protected from yarding damage would be omitted from sal- vage. Yarding distance would not exceed 100 ft.	Contractor permit	High; based on based experience and accessibility to sites

[1] Treatments would include roadside salvage within 100 feet of main haul roads. This component of the action would comply with all applicable design criteria developed for the action as a whole. These design criteria are not intended to limit or interfere with brushing, clearing, or hazard reduction activities associated with routine road maintenance.

#	PROJECT DESIGN AND MITIGATION MEASURE	IMPLEMENTATION METHOD	EFFECTIVENESS
54	No more than 80 dead or dying trees per mile (approximately 8 trees/acre) could be designated for cutting on each side of the road.	Contractor permit	High; based on based experience and accessibility to sites
55	Maximum opening size is one acre on each side of a road, or a maximum of 400 feet along the road.	Contractor permit	High; based on based experience and accessibility to sites
56	Openings would be separated from other forest openings by at least 200 feet of pole size or larger forest along the road, on both sides, to provide cover for wildlife crossing.	Contractor permit	High; based on based experience and accessibility to sites
57	Slash from salvage would be lopped and scattered, hand piled and burned in the woods, or removed from the site at the discretion of the District Ranger considering the Forest objective of maintaining less than 12 tons per acre of fine fuels.	Contractor permit	High; based on based experience and accessibility to sites

MONITORING

FOREST PLAN MONITORING

As part of implementing the Nez Perce Forest Plan, the Nez Perce Forest monitors a multitude of effects and conditions within the Forest. The Forest Plan Monitoring items are displayed on pages V-4 through 8 and Appendix O of the Nez Perce Forest Plan. These monitoring activities are applied on a sample basis randomly across the Forest or among projects. Some of that monitoring may occur within the American and Crooked River analysis area. Forest Plan monitoring is reported in an annual monitoring and evaluation report.

PROPOSED MONITORING FOR THIS PROJECT

Monitoring is a process of gathering information through observation and measurement to assure the goals, objectives and standards of the Nez Perce Forest Plan are implemented and to ensure implementation and effectiveness of design criteria or mitigation. Monitoring will also be designed to meet the needs of the Biological Opinions from NOAA Fisheries and U. S. Fish and Wildlife Service regarding possible take of listed rainbow/steelhead trout and bull trout.

Two forms of monitoring are proposed: 1) implementation 2) effectiveness. These two types of monitoring are described below:

- Implementation monitoring is used to determine if management practices are implemented as planned in the Nez Perce Forest Plan, the American and Crooked River FEIS and or this BE/BA.
- Effectiveness monitoring is used to determine if management practices, as designed and executed, are effective in meeting project objectives as defined in the FEIS as well as the BE/BA and Biological Opinion. Also included are the goals, objectives, and standards of the Plan (Nez Perce Forest Plan.

The results of all monitoring will be shared with NOAA Fisheries and U.S. Fish and Wildlife Service biologists on the Level 1 Team. Any actions requiring additional information will be identified and corrective actions will be designed using recommendations from the Level 1 Team.

Monitoring Applicable to All Activities

Implementation monitoring of the *design criteria and mitigation* would be conducted on a sample basis. Monitoring would be accomplished by agency representatives overseeing the action, as well as an interdisciplinary and/or multi-party team through a combination of any of the following methods:

- Review contract specifications
- Review designs and plans of operation
- Review contract administration reports (daily diaries)
- Review activities on the ground before, during, and after implementation.

Implementation monitoring will focus on design criteria and mitigation as well as the Biological Opinion terms and conditions for ground disturbing activities like temporary road construction and subsequent decommissioning, timber harvest and subsequent slash disposal, road maintenance, culvert replacement, instream improvements and road decommissioning. Inventory forms will be made available listing the appropriate design and mitigation measures from Table 7 above. These monitoring forms will be reviewed and maintained in the District files. Reports will be made of significant erosional events. Problems will be noted and corrective actions taken within the scope of contract provisions.

Effectiveness monitoring (qualitative and quantitative) to determine if design criteria achieve their objectives and if treatments help meet goals and objectives, as described in Chapters 1 and 2 of the American and Crooked River EIS as well as the corresponding Biological Opinions. Sampling will also be conducted to monitor turbidity and compliance with the Idaho State Water Quality Standards and Clean Water Act. Effectiveness monitoring would be accomplished using established protocols specific to each criterion.

Effectiveness monitoring (quantitative) will focus on activities adjacent to and within occupied habitat for listed rainbow/steelhead and bull trout. The effect pathways with the greatest potential for change are sediment and water temperature and monitoring will focus on channel morphology and fish habitat. A sample of the annual activities will be identified in cooperation with NOAA Fisheries and U.S. Fish and Wildlife Service. Sites chosen will be inventoried for baseline conditions using agreed upon methodologies. Follow up monitoring at these sites will be completed immediately after the action and the year following. A review of the data from the following year will determine the effectiveness of the mitigation and design criteria and whether subsequent monitoring is needed.

Turbidity monitoring will require water samples being taken while in stream activities are occurring in or directly above occupied habitat. Samples will be taken at the mixing zone as described by the Idaho State Water Quality Standards. The State DEQ will be notified along with NOAA Fisheries and U.S Fish and Wildlife Service if these standards are exceeded. The mitigation and design criteria will be modified to address the cause for increased suspended sediment or the project will be re-designed.

Effectiveness monitoring in American River will tier to data gathered by the Bureau of Land Management. Two permanent monitoring stations have been established by the Bureau of

Land Management, and monitored over time in American River. This work will continue with cooperation from the Bureau of Land Management.

A permanent station will be established in lower Crooked River to set baseline conditions with follow up monitoring to determine trends in sediment and water temperatures.

Before and after stream surveys will be conducted in Crooked River where instream improvements are planned. This monitoring will track upward trend, with expected increases in pool habitat and pool quality. In general, these instream improvements are expected to increase the carrying capacity for fish in Crooked River, moving this stream toward its fish/water objective. Permanent stations will be located to document fish population responses. These stations will be established in coordination with existing parr monitoring stations monitored by Idaho Department of Fish and Game.

Monitoring in Crooked River will reference USFS stream survey information, Clearwater BioStudies, Inc.1990 Fish Habitat Characteristics, Riparian Conditions and Salmonid Abundance in the Crooked River Study Area, USDA South Fork Clearwater River Habitat Enhancement 1983-1991 (P. Siddall, 1992), Intensive Evaluation and Monitoring of Chinook Salmon and Steelhead Production Crooked River and Upper Salmon River Sites, BPA Annual Reports 1993, 1995 (R. Kiefer, June, 1995 and October, 1999, along with Weir counts from the Crooked River weir manned by Idaho Department of Fish and Game.

FISH MONITORING

The isolated westslope cutthroat trout populations in Whitaker and Queens Creek will have genetics samples taken to document existing genetic make up for comparison with fish populations in a connected system. Dialog will continue with Bureau of Land Management, Idaho Department of Fish and Game, and research biologists as to benefits associated with connecting streams to the mainstem river.

SOUTH FORK CLEARWATER RIVER MONITORING

Condition and trend monitoring of the mainstem river will be tiered to the upcoming (Spring 2005) State Water Quality TMDL.

THREATENED AND ENDANGERED FISH SPECIES

The FEIS maps 8a and 8b display the distribution of fish species as well as prescription watershed boundaries within the project area.

AMERICAN RIVER AND CROOKED RIVER INCLUDE PROPOSED CRITICAL HABITAT FOR LISTED STEELHEAD/REDBAND TROUT AND NOT FOR LISTED BULL TROUT.

STEELHEAD TROUT

Steelhead Trout *(Oncorhynchus mykiss gairdneri)* in the Snake River steelhead ESU, currently compromised of only anadromous forms is listed as a threatened species under the Endangered Species Act (Federal Register Vol. 62, No. 159, August 18, 1997). Resident forms (redband rainbow) are proposed for inclusion in the ESU, also as a threatened species. The ESU includes all natural-origin populations of o. mykiss in the Snake River Basin of southwest Washington, northeast Oregon, and Idaho downstream from long-standing barriers. Certain hatchery stocks in the Snake River Basin are proposed for listing. In the action area, resident O. mykiss proposed for listing, and listed steelhead may occupy the same streams. These life-history forms cannot readily be distinguished from one another as juveniles, consequently, juvenile O. mykiss are referred to as "rainbow/steelhead" when their lineage as anadromous or resident life-history forms cannot be determined.

Steelhead trout are distributed throughout the South Fork Clearwater sub basin and the American and Crooked River watersheds (USDA 1999). The South Fork Clearwater sub basin and all accessible tributaries were proposed as critical habitat for steelhead (Federal Register Vol. 64, No. 24, February 5, 1999), but this proposal was recently rescinded, and the critical listing process has been recently reinitiated. It is likely that the South Fork Clearwater River and American and Crooked Rivers will be included as critical habitat when this designation is final.

Steelhead trout in Idaho are the anadromous form of rainbow trout, which have been further classified as redband trout of the Columbia River basin (Behnke 2002). "Anadromous" refers to a life history whereby fish spawn and rear in freshwater but migrate to the ocean before maturing and returning to fresh water to spawn. Steelhead trout and most species of salmon follow an anadromous life history, and adults of both may attain large size as a result of time spent in the ocean. Populations of redband trout in the Columbia River basin, including those in Idaho, generally follow either an anadromous or resident life history. Some stream systems may support both types of individuals.

Steelhead trout spawning and rearing in the American River and Crooked River area generally enter fresh water in late summer and fall, spend the winter in the lower and middle Clearwater River below Kooskia, and migrate up the South Fork Clearwater River in early spring. Spawning usually occurs in April and May, probably in the mainstem and lower reaches of tributary streams. Juveniles usually spend about two years in streams and rivers, sometimes three, before migrating downstream to the ocean during the spring runoff period in May and June (Behnke, 2002).

In the American River, juvenile steelhead trout have been documented in Upper, Middle, and Lower American River, East Fork American River, Flint Creek, and Box Sing Creek. In Crooked River, juvenile steelhead trout have been documented in Lower Crooked River, Relief Creek, Middle Crooked River, Silver Creek, and Quartz Creek.

INTERIOR REDBAND

Interior Redband Trout *(Oncorhynchus mykiss gairdneri)* includes both anadromous steelhead (discussed above) and native resident rainbow trout that do not migrate to the ocean (Behnke, 2002). They are classified as the same species, except fish included in this category spend their entire lives in a stream or river, often at or near their natal area. Both resident and the anadromous form are listed as threatened under the Endangered Species Act (Federal Register/Vo.69, No. 113, 33119).

In most anadromous steelhead populations, a portion of the juveniles do not migrate to the ocean and remain as resident redbands throughout their lives (Behnke, 2002). This is the likely scenario in the American and Crooked River watersheds. Most juveniles migrate to the ocean but small percentages probably remain as resident fish. There are no known isolated populations that are exclusive resident, although redband spawning was observed in East Fork

Relief Creek (W. Paradis personal observation, 2003) such populations exist elsewhere on the Nez Perce National Forest and in the South Fork Clearwater sub basin.

BULL TROUT

Bull trout (*Salvelinus confluentus*) in the Columbia River basin have been listed as threatened under the Endangered Species Act (Federal Register Vol. 63, No. 111, June 10, 1998). Critical habitat for bull trout has been proposed by the U.S. Fish and Wildlife Service (Federal Register Vol. 67, No. 71235, 2002) and is under review at this time. American River and Crooked River are included as proposed critical habitat, likely including tributary streams like East Fork American River and Kirks Fork.

Bull trout are actually a char and are included in the genus *Salvelinus,* along with brook trout, lake trout, Dolly Varden, and Arctic char. The bull trout and Dolly Varden were long considered the same species and are generally similar in appearance, but skeletal and genetic analyses have shown they are separate species (Behnke 2002). Large bull trout are known as voracious predators of other fish, although small bull trout typically feed on invertebrates. Bull trout spawn in the fall, typically in the coldest reaches of smaller tributaries. Clean substrate (rocks), cold water temperatures, and the presence of cover are important attributes of preferred bull trout habitat.

Bull trout are especially vulnerable to human-induced factors that increase water temperature and sediment loads, change flow regimes, block migration routes, and establish non-native trout, particularly brook trout (Behnke, 2002).

Bull trout are present in the South Fork Clearwater River and many of its tributaries, including American River and Crooked River. Bull trout have been documented in American River, Upper American River East Fork American River, and Kirks Fork. One bull trout was observed in the 1989 survey of Flint Creek and no bull trout have been documented using Box Sing Creek.

Crooked River is an important stream for bull trout. The weir at the mouth of this system is managed by Idaho Department of Fish and Game. They observe both adult and juvenile bull trout moving in and out of the system. The headwaters provide important spawning and rearing habitat for this fish and the mainstem is a well-used travel corridor. Bull trout have been observed using Lower Crooked River, Relief Creek, Middle Crooked River, and Silver Creek. The upper Crooked River watersheds (outside the project area) are recognized as very important for spawning and rearing of bull trout.

There is no proposed critical habitat in the project area for American River or Crooked River. Both watersheds are managed under the Nez Perce Forest Plan, which includes Amendment 20. The Federal Register/ Vol. 69, No. 193 page 60021 (October 6, 2004) revises the proposed critical habitat designation (Federal Register/ Vol. 67, No. 230 (November 29, 2002) to exclude all stream reaches regulated under PACFISH.

FALL CHINOOK SALMON

Fall Chinook Salmon *(Oncorhynchus tschawytscha)* is listed as a threatened species in the Clearwater River basin (Federal Register, Vol. 57, No. 78, 14653, April 22, 1992). Fall chinook salmon are not found in the American and Crooked River area, but they do occur downstream in the lower reaches of the South Fork Clearwater River and in the mainstem Clearwater River.

Snake River fall chinook salmon were historically less well-distributed across the upper Snake River basin than spring and summer chinook, although the Snake River basin, including the Clearwater River, was considered to support the highest production of fall chinook salmon in the entire Columbia River basin. The historic importance of the Clearwater River in providing spawning and early rearing habitat is presently unclear, but it is assumed it sustained a significant component of the entire population.

Snake River fall chinook begin entering the Columbia River in August and continue through October, with peak migration occurring in early September. Returning adults have generally spent three or four years in the ocean. Adults generally arrive in the Clearwater River in October with fish present from September through December. Spawning occurs from November through early December. Fry emerge from late winter to early spring, juveniles rear over the ensuing spring and summer months, then migrate to the ocean in the fall before they are a year old.

SENSITIVE AND STATE LISTED SPECIES

In a letter dated March 12, 1999, the USDA Forest Service Northern Region Sensitive Species list was updated to include interior redband trout, boreal toad, northern leopard frog, and other wildlife and plant species on the Nez Perce National Forest.

SPRING CHINOOK SALMON

Spring Chinook Salmon *(Oncorhynchus tschawytscha)* are considered a sensitive species in the Northern Region, USDA Forest Service and are a species of special concern in the State of Idaho. They are not listed as a threatened species under the Endangered Species Act in the South Fork Clearwater sub basin because indigenous populations were likely eliminated from the Clearwater River by construction of Lewiston Dam in the early 20th century (Schoen et al. 1999; Murphy and Metsker, 1962). Naturalized populations of spring chinook salmon, however, have been re-established in the South Fork Clearwater sub basin, including American River and Crooked River, as a result of reintroduction efforts (Schoen et al. 1999) by federal and state agencies and the Nez Perce Tribe.

Both the American River and Crooked River watershed have a high inherent capacity to support spring chinook salmon (USDA 1998), based on features such as climate, relief, and geology. These river systems are comprised of significant lengths of low gradient, meadow reaches that provide optimal spawning and rearing habitat for this species, offering large areas of appropriately-sized spawning gravels as well as preferred low gradient rearing habitat for juveniles (USDA, 2003).

Historically, significant numbers of spring chinook salmon spawned and reared in these systems as well as other tributaries of the South Fork Clearwater River. Currently, adult returns vary but are generally low. In 2003, the weir at the mouth of Crooked River counted 1360 returning adult spring chinook. The 1990 fish habitat survey conducted by Clearwater BioStudies, Inc. (Fish Habitat Characteristics, Riparian Conditions and Salmonid Abundance In The Crooked River Study Area, November, 1990) identified 9810 square meters of spawning gravel available in the mainstem river from the mouth to Orogrande. If this habitat were fully seeded, even in the existing condition, there is potential to produce over 500,000 spring chinook smolts annually in Crooked River. The American River is a very similar system. Both rivers have been dredge mined using large floating bucket line dredges which resulted a loss of pool habitat, removal of acting and potential woody debris and wider more shallow streams.

Spring chinook salmon have been identified in Upper, Middle, and Lower American River, East Fork American River, Kirks Fork, Flint Creek and Box Sing Creek. In Crooked River, they have been identified in Lower Crooked River and Middle Crooked and are likely to also use Relief Creek, Silver Creek, and Quartz Creek.

WESTSLOPE CUTTHROAT

Westslope Cutthroat Trout *(Oncorhynchus clarki lewisi)* are considered sensitive in the Northern Region, U.S. Forest Service, and a species of special concern by the State of Idaho. Currently, they are not listed or proposed for listing under the Endangered Species Act. In a letter dated June 10, 1998, the U.S. Fish and Wildlife Service "determined that a petition to list the westslope cutthroat trout…presented substantial information indicating that the requested action may be warranted". Cutthroat trout are widely distributed across the Clearwater basin, although the current abundance is probably less than historic abundance.

Westslope cutthroat trout are widespread in the project area, and have been found in virtually every tributary where surveys have been conducted. Populations may also be present in additional areas where surveys have not been conducted or where existing information is insufficient to define species presence or absence. Strong populations of resident fish have been observed in Quartz Creek and Silver Creek.

The isolated populations in Queen and Whitaker offer unique opportunities to study genetic differences between isolated fish and those subject to hybridization with non-native rainbow trout. There is also the opportunity to connect these streams to the mainstem and monitor fish dispersal and genetic changes.

Although population status of resident westslope cutthroat trout is thought to be strong in some streams, the larger fluvial fish, those moving out of the tributaries and rearing in the mainstem are showing very low densities, making this species at risk.

Primary existing threats to westslope cutthroat trout in the project area include habitat degradation, loss of connectivity among populations, competition with non-native brook trout, and harvest of adults by anglers.

PACIFIC LAMPREY

Pacific Lamprey *(Lampetra tridentata)* is considered a State of Idaho species of special concern. Recent sampling in the South Fork Clearwater River indicated the presence of juvenile lampreys along the mainstem river and some of the tributaries (Cochnauer and Clair, 2003). Similar sampling conducted in Crooked and American Rivers in 2001 did not identify any lampreys (Cochnauer, Clair BPA Annual Reports 2001 and 2002). Much of American River and the lower reaches of Crooked River were likely historic habitat for lamprey (Clair, per. Comm., 2004)

INTRODUCED NON-NATIVE FISH

Brook trout (*Salvelinus fontinalis*) have been introduced to the area and are present in both American River and Crooked River.

ESSENTIAL FISH HABITAT

Pursuant to section 305(b) of the Magnuson-Stevens Act and its implementing regulations, 50 CFR Part 600.920, Federal agencies must consult with NMFS regarding any of their actions authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken that may adversely affect Essential Fish Habitat (EFH). The Magnuson-Stevens Act, section 3, defines EFH as "those waters and substrate necessary for fish for spawning, breeding, feeding, or growth to maturity." Federal agencies may incorporate an EFH Assessment into ESA Biological Assessments. EFH habitat for coho is not in the project area and is limited to the mainstem Clearwater River over 50 miles downstream

Chinook salmon (*Oncorhynchus tschawytscha*) (see above for detailed life history) EFH for chinook salmon includes all historically accessible reaches of the Clearwater drainage (except the North Fork above Dworshak Dam). EFH for chinook is present in both American River and Crooked River.

Coho salmon (*Oncorhynchus kisutch)* were once native to the Clearwater River basin. Their distribution was primarily associated with tributaries of the Lower Clearwater River. Historic runs were extirpated and we are mostly dealing with a fish that the Nez Perce Tribe is stocking from area hatcheries. The Clearwater River coho enter the Columbia River in August and September. They reach the Clearwater River in October and spawn in November and December. The juvenile fish emerge in March and April and they out-migrate in May and June after spending one to two years rearing in their natal stream. There is some sign of movement to mainstem habitats for winter rearing. Clearwater coho return in 1.5 years as adults (Jody Brostrom, FWS and Sherman Sprague Nez Perce Tribe, personal communications).

Baseline Conditions for Soils, Watershed, and Fish

SOILS

Geology in the Crooked and American River watersheds consists of Precambrian metamorphic rock that is mainly gneiss, schist, and associated quartzites. They weather to sandy loam, loamy sand, or sand parent materials and are moderate to highly erodible. The granitic rocks in Crooked and American Rivers are mostly biotite granodiorite, which is part of the Idaho Batholith. These granites weather to loamy sands and sand parent material, and are typically highly erodible.

Most soils in project area have surface layers formed in volcanic ash-influenced loess. A layer of volcanic ash influenced loess was deposited on the project area approximately 6700 years ago after the eruption of Mt. Mazama in Oregon.

LANDFORMS FOR CROOKED AND AMERICAN RIVER

Soil response to disturbance depends not only on soil type, but topographic setting and slope hydrology. Landforms have characteristic slope shape, steepness, and stream dissection, which affect erosion and sediment delivery to streams.

AMERICAN RIVER LANDFORMS

ROLLING HILLS

This is the most common landform in American River, mapped over 80 percent of the watershed. The volcanic ash influenced soil surface layers buffer against erosion except where soil substrata are exposed, as in roads or mines. Substratum erosion hazard from roads is moderate to high. Slopes are gentle to moderate (20-45 percent) and sediment is delivered to streams with moderate efficiency. Unstable slopes are uncommon, and typically occur as small areas on lower slopes or near stream headlands. West and south facing slopes at low elevation may have thin or mixed ash surface layers. These soils do not hold moisture as well as ash-influenced soils and are more liable to surface erosion. Mass wasting and in-channel failures such as debris torrents are uncommon. The streams in these settings are moderate to high gradient in headwater streams, and flow into lower gradient alluvial valleys.

STREAM BREAKLANDS AND STEEP MOUNTAIN SLOPES

Stream breaklands and steep mountain slopes are of limited extent in the watershed (8 percent). In comparison to rolling hills, breaklands have steep slopes, shallower soils, thin or mixed loess surface layers, higher surface erosion risk, higher risk of mass failure, and more rapid delivery of sediment to streams. Substratum erosion hazard from roads is high. Debris torrents can occur in headwater channels after intense rainstorms or rain-on-snow events.

CONVEX RIDGES

Convex slopes are found at upper elevations (5 percent of the area). These landforms occur in the upper elevation areas around Anderson Butte on the east watershed divide of American

River watershed and the Elk Summit area on the west watershed divide of American River. The elevation is above 5000 feet ranging to 6700 feet. In comparison to rolling hills, convex slopes have broader ridges, lower drainage density, and bedrock is usually deeply fractured. Volcanic ash surface layers are typically present and buffer against surface erosion. Substratum erosion hazard from roads is high. Slopes are gentle to moderate (10-45 percent) and sediment is delivered to streams with low efficiency. Unstable slopes are uncommon, and typically occur as small areas on lower slopes or near stream headlands.

Alluvial Valleys

Alluvial valleys form along low gradient stream channels (3 percent of the watershed). Soils are mainly derived from alluvium and sediments deposited on floodplains. They are often poorly drained and subject to water transport most of the year. Substrata are coarse sands with gravel and cobble. Substratum erosion hazard is high in coarse alluvium. Sediment delivery efficiency is very high (USDA FS, 1987); most of this landform is a riparian area. Valley gradients in the alluvial valleys are gentle and streams within this landform are most commonly C channels, with some B channels in steeper sections. Historically, large areas of the alluvial valleys and floodplains were dredge mined in the late 1800's leaving large tailings piles in the alluvial valleys of American River.

Crooked River Landforms

Rolling Hills

Rolling hills occur in the headwaters of the tributaries of lower Crooked River (14 percent of the watershed). The landforms in this portion of the Crooked watershed are similar to the rolling uplands in American River. Refer to the description of Rolling Uplands landforms under American River landform discussion.

Convex Ridges

Convex slopes are found at upper elevations (42 percent of the area). In comparison to rolling hills, convex slopes have broader ridges, lower drainage density, and bedrock is usually deeply fractured. The convex ridges drop into forested breaklands on the lower reaches of 3rd and 4th order watersheds flowing into Crooked River and the slopes above main Crooked River. Convex ridges occur above 5000 feet in the Crooked River watersheds. Volcanic ash surface layers are typically present and buffer against surface erosion. Substratum erosion hazard from roads is high. Slopes are gentle to moderate and sediment is delivered to streams with low efficiency. Unstable slopes are uncommon, and typically occur as small areas on lower slopes or near stream headlands.

Steep Glaciated Lands

Alpine glaciated slopes and till deposits occur at the highest elevations (3 percent of the watershed). They are most common in the headwaters of the West Fork of Crooked River. These landforms have exposed bedrock or glacial till, and moderate to steep slopes. Substratum erosion hazard from roads is high. Sediment is delivered to streams with moderate to high efficiency. Debris torrents can occur in headwater channels after intense rainstorms or rapid snowmelt.

STREAM BREAKLANDS AND MOUNTAIN SLOPES

Stream breaklands and steep mountain slopes are common in the watershed (37 percent). Slopes are 45 to more than 60 percent. They occur most commonly along the mainstem Crooked River, and the lower slopes of 3rd and 4th order streams, and face watersheds flowing into Crooked River In comparison to rolling hills, breaklands have steep slopes, shallower soils, thin or mixed loess surface layers, higher surface erosion risk, higher risk of mass failure, and more rapid delivery of sediment to streams. Debris torrents can occur in headwater channels after intense rainstorms or rain-on-snow events. The substratum erosion hazard from roads is high. First and second order stream channels have steep A channel types. Debris torrents are not extremely common, but can occur after fire or under conditions of saturated soil conditions, intense rainstorms, or rain-on-snow floods.

ALLUVIAL VALLEYS

Alluvial valleys form along low gradient stream channels (2 percent of the watershed). The linear alluvial valley along mainstem Crooked river is the primary alluvial valley in this watershed. Soils are often poorly drained and subject to water transport most of the year. Substrata are coarse sands with gravel and cobble. Substratum erosion is high in coarse alluvium. Some have been dredge mined and only coarse mine spoils remain. Hydrologic and riparian functions of alluvial soils were also lost as a result of the dredge mining. Sediment delivery efficiency is very high (USDA FS, 1987); most of this landform is a riparian area. Valley gradients in the alluvial valleys are gentle and streams are most commonly C channels, with some B channels in steeper sections.

SUMMARY

Crooked and American River watersheds have been heavily managed in the past. Eight percent of Crooked River has been tractor logged and/or dozer piled in the past and 19 percent of American River has been tractor logged and/or dozer piled in the past. Soil compaction alters runoff patterns and soil water availability. Areas of compacted skid trails, landings, and roads can change hydrologic processes by increasing overall water yield and increasing efficiency of runoff into stream channels. Mining, especially in the alluvial valley bottoms has had a great influence on soil disturbance and displacement, especially along mainstem Crooked and American Rivers. The scope of the effects of soil compaction applies to the immediate area impacted, and cumulatively affects watershed scale hydrologic processes, as discussed above.

Soil displacement removes the nutrient-rich volcanic ash surface soils from the site, and the underlying granitic, gneiss, and schist soils are less productive and more highly erodible. Typically, on areas that have been tractor logged and not dozer piled, about 15 to 25 percent of the unit has suffered detrimental compaction and displacement (USDA Forest Service, Nez Perce National Forest Monitoring and Evaluation Reports. 1990 and 1991). On units that have been tractor logged and dozer piled, about 30-70 percent of the unit may have suffered detrimental compaction or displacement (forest plan monitoring data and data on file for the Meadow Face EIS and Red River EAWS).

WATERSHED

CLEAN WATER ACT AND IDAHO STATE WATER QUALITY STANDARDS

The Clean Water Act stipulates that states are to adopt water quality standards. Included in these standards are provisions for identifying beneficial uses, establishing the status of beneficial uses, setting water quality criteria, and establishing BMPs to control non-point sources of pollution.

Under the Idaho Water Quality Standards, designated beneficial uses exist for American and Crooked Rivers (IDAPA 58.01.02). Tributaries of American and Crooked Rivers within the project area do not have designated beneficial uses. However, they do support existing beneficial uses and these are protected under the water quality standards. There are numerous private and two State water uses adjacent to or downstream of the project area. Designated and existing beneficial uses are detailed in Sections 3.2.1. (American River) and 3.2.2. (Crooked River).

The South Fork Clearwater River Subbasin Assessment and Total Maximum Daily Loads (TMDLs) addresses water quality limited streams listed under Section 303(d) of the Clean Water Act (IDEQ et al, 2004). The Assessment and TMDLs is a joint effort of the Idaho Department of Environmental Quality, the Environmental Protection Agency, and the Nez Perce Tribe. The Nez Perce National Forest participated in the assessment and TMDL development, with technical input and representation on the Watershed Advisory Group. The South Fork Clearwater River subbasin TMDLs applicable to the project area are for water temperature and sediment and were approved by the EPA in July, 2004.

Using the currently approved 1998 list, there are no 303(d) listed streams within the project area. However, the entire project area contributes to the South Fork Clearwater River, which is listed for water temperature and sediment. TMDLs were developed for the South Fork Clearwater River for water temperature and sediment. The sediment TMDL targets a 25 percent reduction in human-caused sediment yield to the South Fork Clearwater River. No specific targets were set for tributaries, but it was recognized that much of the sediment yield reduction would need to take place in the tributaries. The water temperature TMDL calls for canopy density or shade targets on a stream reach basis throughout the subbasin. Different analytical approaches were used for forested reaches than for the non-forested reaches and the mainstem South Fork Clearwater River.

In June 2003, the IDEQ issued a draft Integrated 303(d)/305(b) Report for Idaho. The following project area streams were proposed for listing under Section 5 as impaired waters for water temperature: American River (below East Fork American River), Crooked River, East Fork Crooked River, Relief Creek, and Sawmill Creek. The South Fork Clearwater River was proposed for listing for water temperature and sediment. EPA approved the South Fork Clearwater River TMDLs in July, 2004. It is assumed that all of the streams above will be moved to Section 4a, as waters having an approved TMDL.

Section 404 of the Clean Water Act requires permits to dredge or fill within waters of the United States. The US Army Corps of Engineers administers these provisions. Most of the instream activities proposed under the American and Crooked River Project will require authorization under Section 404, through application of either nationwide or site-specific permits.

WATERSHED CONDITION

Watershed condition indicators are a series of metrics that can be used to index the level of disturbance in a watershed. They are usually expressed as densities or discrete amounts of various disturbances within a watershed. For example, road density expressed in miles of road per square mile of watershed area (mi/mi^2) is a common watershed condition indicator. Extensions of that include road density within riparian habitat conservation areas (RHCAs) or landslide prone terrain (LSP). Other indicators include various forms of timber harvest density, such as percent of the watershed harvested, percent of RHCAs harvested and percent of LSP terrain harvested.

Various guidelines have been employed to rate watershed condition based on these indicators. One local version is a matrix that rates watersheds into low, moderate, or high condition based on assembling a broad array of indicators (NOAA Fisheries et al, 1998).

INDICATOR OF WATERSHED CONDITION – ROAD DENSITY

Existing watershed condition indicators were compiled for American River using corporate databases and GIS overlays. They are summarized in the table below:

TABLE 8. WATERSHED CONDITION INDICATORS

Watershed Name	Area (mi^2)	Road Density (mi/ mi^2)	RHCA[1] Road Density (mi/ mi^2)	LSP[2] Roads (miles)	Timber Harvest (% wsd area)	RHCA Harvest (%RHCA area)	LSP Harvest (acres)
Upper American River	10.1	2.0	0.6	0	11	4	0
Middle American River[3]	5.1	3.0	2.7	0	13	5	0
East Fork American River[3]	8.6	1.0	0.7	0	6	3	0
Flint Creek	9.2	3.1	1.7	0	23	13	0
Whitaker Creek	1.4	3.9	2.6	0	27	23	0
Queen Creek	1.7	4.3	3.7	0	33	22	0
Box Sing Creek	1.4	3.3	3.1	0	16	8	0
Kirks Fork	9.8	0.6	0.5	0	4	3	0
Lower American River[3]	6.8	2.0	3.5	0	NA	NA	NA
Entire American River	91.6	2.3	1.9	0.4	NA	NA	NA

Various watershed road density criteria have been used to assess watershed condition. Local guidelines have been developed that suggest <1 mi/mi^2 is one indicator of good watershed

[1] RHCA = Riparian Habitat Conservation Area

[2] LSP = Landslide Prone Terrain

[3] Data compiled for composite watersheds, not pure watersheds

condition, 1-3 mi/mi^2 is moderate and >3 mi/mi^2 is low (NOAA Fisheries, et al 1998). Of the 9 project prescription watersheds in American River, 5 are in the low condition category and only 1 is in the high condition category.

The density and distribution of roads within most of the subwatersheds indicate there is a high probability that the hydrologic regime (i.e. timing, magnitude, duration, and spatial distribution of runoff) is substantially altered. Road surfaces limit infiltration which causes surface runoff during storm events and snow melt. Insloped roads with ditches have the greatest effect. Native surface roads with traffic can often develop ruts, which cause runoff to be concentrated on the road surface. Roads are also subject to surface and mass erosion. Surface erosion is the dominant erosion process on roads in American River. Field inventories have identified problem areas and prioritized needs.

Timber harvest has affected a relatively high proportion of Queen, Whitaker, and Flint Creeks. This has affected water yield and timing through reductions in forest canopy and soil compaction from skid trails and landings. A relatively high proportion of RHCAs have been harvested in Whitaker and Queen Creeks. Though unquantified, a considerable amount of timber harvest has occurred in Lower American River. Mass erosion is a relatively minor process in American River. There is a minimal amount of past roading and timber harvest on landslide prone terrain.

TABLE 9. AMERICAN RIVER POST-PROJECT ROAD DENSITY

Watershed Name	Area (mi^2)	Alt A (existing)	Alt D	Alt D additional
Upper American River	10.1	2.0	2.0	1.9
Middle American River[1]	5.1	3.0	2.5	2.2
East Fork American River[1]	8.6	1.0	0.9	0.8
Flint Creek	9.2	3.1	2.8	2.1
Whitaker Creek	1.4	3.9	3.4	3.4
Queen Creek	1.7	4.3	3.0	2.7
Box Sing Creek	1.4	3.3	2.9	2.7
Kirks Fork	9.8	0.6	0.6	0.6
Lower American River[1]	6.8	2.0	1.9	1.9
Entire American River	91.6	2.3	2.2	2.1

[1] Data compiled for composite watersheds, not pure watersheds

TABLE 10. CROOKED RIVER POST-PROJECT ROAD DENSITY

Watershed Name	Area (mi^2)	Alt A (existing)	Alt D	Alt D additional
Middle Crooked River[1]	22.6	1.8	1.6	1.6
Relief Creek	11.7	3.3	2.9	2.6
Lower Crooked River[1]	14.8	3.2	3.1	3.0
Entire Crooked River	71.3	1.9	1.8	1.7

SEDIMENT YIELD/SUBSTRATE

Sediment yield is defined as the movement of sediment past a point in the stream system over a period of time. On the Nez Perce National Forest, sediment yield is generally modeled using NEZSED, which is the Forest's adaptation of the R1R4 Sediment Yield Guidelines (USDA Forest Service, 1981). The model accounts for natural background sediment and activity sediment generated from roads, timber harvest, and fire. The activity sediment is estimated from surface erosion processes and small mass failures (< 10 yd^3). Sediment yield is commonly expressed as tons/year or percentage over baseline. Appendix A of the Nez Perce National Forest Plan stipulates guidelines for sediment yield and entry frequency on a subwatershed basis (USDA Forest Service, 1987).

The proposed timber harvest, road activities, and watershed improvement activities could affect sediment yield over time. Harvest and road related activities have the potential to increase sediment production and delivery into streams. Watershed improvement projects have the potential to produce sediment in the short-term, but many are designed to result in long-term reductions in sediment on a watershed basis. Sediment yield modeling is used as one indicator to determined trends in water quality and fish habitat conditions.

NEZSED has been tested using locally collected sediment yield data (USDA Forest Service, 1998). Results of the individual tests varied with some predictions being over and under, with others being close, to measured values. The net result is that the model has been determined to be a reasonably realistic tool for alternative assessment. The model has limitations in that it does not incorporate certain processes related to activity-generated sediment yield, including stream bank erosion and mass failures >10 yds^3 in size. Further disclosures of NEZSED model limitations and field tests are found in Appendix B.

Long term monitoring of sediment is limited in this area. Work in the Red River watershed can provide some insight into what may occur in American and Crooked Rivers. The following narrative is an excerpt from Red River EAWS, Chapter 4, pp 4-60 to 4-61:

> *Trend data exists for three aquatic monitoring stations within the Red River watershed; one each on upper Red River (just below Shissler Ck.), lower Red River (above Red R. Ranger Station), and Trapper Creek (at gaging station above Rd 421 crossing). These stations, although limited in number, allow for some inference of trends in aquatic conditions in three of four ERUs established for this EAWS (Upper and Lower Red River and South Fork, respectively). Monitoring data were collected in five different years at the upper Red River station, three years at the lower Red River station, and two years at the Trapper Creek station.*

Weighted cobble embeddedness at the upper Red River monitoring station (all transects combined) shows a statistically significant (p=0.048) improving trend (illustrated by a negative slope and decreasing embeddedness over time) since the late 1980s. Four of five transects at the upper Red River station show an improving trend (negative slope) in weighted cobble embeddedness over this same time period. At the lower Red River monitoring station, two of five transect show an improving trend in weighted cobble embeddedness. The trend for the lower Red River monitoring station as a whole (transects combined) is unclear; regression analysis reveals an overall declining trend in condition (positive slope) although statistical evaluation of that trend is not significant (p=0.597). Weighted cobble embeddedness values were only recorded in two years at the Trapper Creek monitoring station making statistical evaluation of trend data inappropriate. Two of five transects at the Trapper Creek station showed higher levels of (weighted) cobble embeddedness in 2002 than in 1989. However, data combined across all transects suggests a possible improving trend (slope = -0.32) at this station.

TABLE 11. AMERICAN RIVER – PERCENT (%) OVER BASE SEDIMENT YIELD

Watershed Name	Area (mi^2)	Year	Alt A (existing)	Alt D	Alt D additional
Middle American River[1]	23.8	2003	13	13	13
		2005	12	14	14
		2012	12	12	11
East Fork American River[1]	18.4	2003	12	12	12
		2005	12	17	17
		2012	12	10	9
Flint Creek	9.2	2003	15	15	15
		2005	15	23	23
		2012	15	12	11
Whitaker Creek	1.4	2003	66[2]	66	66
		2005	31	38	36
		2012	31	30	30
Queen Creek	1.7	2003	37	37	37
		2005	37	57	58
		2012	37	32	31
Box Sing Creek	1.4	2003	21	21	21
		2005	21	34	34
		2012	21	19	19

[1] Composite watersheds were combined with upstream watersheds for sediment yield analysis.
[2] Reflects private land harvest in 2003

Watershed Name	Area (mi²)	Year	Alt A (existing)	Alt D	Alt D additional
Kirks Fork	9.8	2003	5	5	5
		2005	5	9	9
		2012	5	5	5
Lower American River[1]	91.6	2003	16	16	16
		2005	15	17	17
		2012	15	14	14

Sediment yields in the peak activity year of 2005 stay below Forest Plan sediment yield guidelines. Entry frequency guidelines are also met with this action. In most cases, the chronic sediment yield over base is lower in 2012 than in pre-project conditions. This reflects the effect of decommissioning and improvements on existing roads.

TABLE 12. CROOKED RIVER PERCENT (%) OVER BASE SEDIMENT YIELD

Watershed Name	Area (mi²)	Year	Alt A (existing)	Alt D	Alt D additional
Middle Crooked River[1]	44.8	2003	5	5	5
		2005	5	7	7
		2012	5	4	4
Quartz Creek	4.1	2003	7	7	7
		2005	7	15	15
		2012	7	7	7
Silver Creek	4.2	2003	18	18	18
		2005	18	42	43
		2012	18	12	12
Relief Creek	11.7	2003	17	17	17
		2005	17	28	28
		2012	17	15	14
Lower Crooked River[1]	71.3	2003	9	9	9
		2005	9	13	13
		2012	9	8	8

All peak year sediment yield increases fall below the Forest Plan sediment yield guideline of 30 percent over base. Entry frequency guidelines are also met with this action. Silver and Quartz Creeks are not Forest Plan prescription watershed and therefore do not have established sediment yield guidelines. Given their channel types and beneficial uses, these guidelines

[1] Composite watersheds were combined with upstream watersheds for sediment yield analysis.

would likely be set at not to exceed 45 percent over base. All of the alternatives fall below that level.

WATER YIELD

Equivalent Clearcut Area (ECA) analysis is a tool used to index the relationship between vegetation condition and water yields from forested watersheds. The basic assumptions of the procedure are that removal of forest vegetation results in water yield increases and that ECA can be used as an index of these increases. Depending on the interaction between water yield, sediment yield, and stream channel conditions, such increases could have impacts on stream channels.

Water yield increases can be directly modeled, but equivalent clearcut area (ECA) is often used as a surrogate. The ECA model is designed to estimate changes in mean annual streamflow resulting from forest practices or treatments (roading, timber harvest, and fires), which remove or reduce vegetative cover, and is usually expressed as a percent of watershed area (Belt, 1980). The index takes into account the initial percentage of crown removal and the recovery through regrowth of vegetation since the initial disturbance. For purposes of this assessment, ECA will be used to index changes in water yield through time based on timber harvest and roading disturbances.

There are a number of physical factors that determine the relationship between canopy conditions and water yield. These include interception, evapo-transpiration, shading effects and wind flux. These factors affect the accumulation and melt rates of snow packs and how rainfall is processed. The ECA analysis takes into account the initial percentage of crown removal and the recovery through vegetative re-growth since the initial disturbance in the case of timber harvest or fire. Within the habitat types being treated under this project, the time frame for complete ECA recovery to occur is estimated to be 65 to 85 years (USDA Forest Service, 1974).

Additional factors affecting water yield include compacted surfaces due to roads, skid trails, and landings. Existing and new roads are considered as permanent openings in the ECA model. Decommissioned roads are considered as openings, so the road decommissioning projects do not contribute to reductions in ECA.

Various ECA thresholds of concern have been in use in the Northern Region since the 1960s (Gerhardt, 2000). Early cutting guides recommended a limit of 20-30 percent ECA within a watershed (Haupt, 1967). Recently, concern over water yield changes relative to stream channel condition has focused on smaller headwater catchments. Research in the nearby Horse Creek watershed study have demonstrated instantaneous peak flow increase up to 34 percent and maximum daily flow increases up to 87 percent, resulting from road construction and timber harvest in small catchments (King, 1989). Recent observations have suggested that channel erosion from these streams may be contributing to increased bedload sediment in the 3rd order-receiving channel (Gerhardt, 2002).

The studies by Belt (1980) and King (1989) have also served as field tests of the ECA procedure. Belt concluded that the ECA procedure is a rational tool for evaluation of hydrologic impacts of forest practices. King recommended local calibration of the model and a greater emphasis on conditions in 1st and 2nd order headwater streams. Limitations of the ECA model are further disclosed in Appendix B.

CHANNEL MORPHOLOGY

Water and sediment yield can interact to change channel morphology conditions through erosion of stream channels or deposition of sediment. Channel morphology can also be affected directly through activities such as road encroachment, stream crossings and in-channel improvements. Sediment delivery and routing processes vary by upland settings, stream types and disturbance level and type.

Sediment routing considers the disposition of sediment within the watershed system, including processes of erosion, deposition, storage and transport. It includes upslope and instream components. The upslope component includes initial detachment, erosion and delivery efficiency. The instream component includes suspended and bedload sediment yield, as well as substrate deposition and composition. The instream component also includes consideration of streamflow and channel morphology, both of which influence the capability of the stream to transport or deposit sediment.

Indicators of channel morphology: Channel type, stream geometry and substrate composition.

WATER QUALITY (TOXICS AND TEMPERATURE)

Water quality includes physical and chemical characteristics of water. Parameters commonly measured include pH, alkalinity, hardness, specific conductance, nutrients, metals, sediment and water temperature. Many of these parameters are affected to only a slight degree by forest practices. Water temperature controls the rate of biologic process, is of critical concern for fish populations, and is a primary indicator of habitat conditions.

Changes in streamside shading in Riparian Habitat Conservation Areas could result in changes in water temperature. Changes in shading can be due to succession, mortality, and human activities. (See Appendix B for details on existing water Temp.)

Indicators of water temperature: Water temperature, canopy density in forested reaches, and percent shade in non-forested reaches

Water temperature was recorded at several locations in the American River watershed during the summer of 2003. These sites were American River at the Forest boundary, East Fork American River, Flint Creek, Queen Creek, Kirks Fork, and American River at the mouth. These data are shown in Appendix B. The data show a considerable variation across the watershed. Violations of the Idaho salmonid spawning criterion of not-to-exceed 13˚ C were noted at all sites at certain times. Violations of the Idaho cold water communities of not-to-exceed 22˚ C were noted at American River at the Forest Boundary and at the mouth. Violations of the EPA criterion of not-to-exceed 10˚ C (as a 7-day average of daily maximums) were noted at all sites. Some basic metrics from the 2003 data are shown in Table 13 below.

TABLE 13 – SUMMARY OF 2003 WATER TEMPERATURE DATA

Stream Name/Site	Number of Days ≥ 20˚C	Maximum Instantaneous (˚C)
American River at Forest Boundary	31	22.9
East Fork American River	0	17.5
Flint Creek	0	19.8
Queen Creek	0	17.0
Kirks Fork	7	20.6
American River near mouth	46	25.6

Under the no action alternative, insect and disease agents may tend to reduce shade over time in some riparian stands. Shade in dredge-mined reaches would tend to increase very slowly over time as these areas are naturally recolonized by riparian vegetation. These reaches are mostly outside the project area.

A number of water quality parameters were sampled at stream sites in American River during the period 1977-1981. Summaries of data for pH, conductivity and hardness for Upper American River, Flint Creek, and Lower American River are found in Table B.6 (see Appendix B). These data show that pH is near neutral to slightly acidic, which is considered normal for area streams. Conductivity and alkalinity are both relatively low, indicating relatively low amounts of dissolved constituents and also relatively low biological productivity.

FISH HABITAT ELEMENTS

INTRODUCTION

I will first provide a narrative description of the prescription watersheds where project activities are planned to occur. This discussion will begin with American River and it will be followed by Crooked River. Following, will be a listing of the elements used to describe in general, how we determine exiting conditions for fish and fish habitat. This analysis will focus on six elements of fish habitat: sediment, large woody debris, pool habitat, water yield, water quality, habitat connectivity. These elements use a combination of DFC and RMO attributes and all are linked to the Matrix of Pathways and Indicators of Watershed Condition This general discussion will be followed by a detailed description and how these elements will change as a result of this project. We will end with a discussion of cumulative effects.

AMERICAN RIVER

AMERICAN RIVER (UPPER, MIDDLE AND LOWER) PRESCRIPTION WATERSHEDS -#17060305-05-09,06,16

American River is a large watershed with important aquatic values and a high priority for restoration of aquatic processes. The mainstem river is broken into three prescription watersheds. Upper American River is above the Elk City Township and primarily includes lands administered by the Forest Service. Middle American River extends into the township and has experienced extensive amounts of placer mining and fish habitat degradation. Lower American

River is within the township and has experienced similar impacts. The Bureau of Land Management administers lands within this area and much of the survey data and background information comes from their work (BLM, American River BA/BE, March 1999). Steelhead trout, bull trout, cutthroat trout, spring/summer chinook salmon, rainbow trout, pacific lamprey, mountain whitefish, sculpin, and dace are present in the American River watershed. Their distribution is widespread, with the exception of bull trout for which the distribution is not well known. Brook trout are also present and widely distributed. Spring chinook salmon and steelhead trout abundance is low. Westslope cutthroat trout populations vary; some areas are devoid of cutthroat trout while others have relatively high densities. The higher densities of cutthroat appear correlated with undeveloped areas in American River. There are very few large-sized migratory cutthroat trout.

Migratory bull trout are present in American River, although at low levels. The extent of resident bull trout in American River is not well known. Currently, it appears that the East Fork American River potentially provides the only spawning and early rearing areas for bull trout in the watershed. This project proposes only road decommissioning in East Fork American River. Surveys conducted by Forest Service in 1998 did not document occurrences of bull trout in upper American River. Recent fish surveys conducted by Bureau of Land Management, Forest Service, and Idaho Department of Fish and Game (1996-2003) documented bull trout in mainstem American River, East Fork American River, and lower Kirks Fork.

The Bureau of Land Management surveyed Lower American River in 1992 using a modified Hankin and Reeves (1988) survey methodology. The dominant channel type was B, average gradient was 2 percent, and unstable stream banks averaged 2 percent. Lower American River occurs within the Elk City Township and a large amount of the stream bottom has been dredge mined. Yearlong and seasonal residences occur along some stream reaches. Dredge mining has reduced quality of pools and large woody debris is lacking. Dredge mining activity has reduced large woody debris recruitment along some reaches. High summer water temperatures and deposited sediment also reduce fish habitat quality.

The Forest Service last did an extensive survey of American River (upstream from Bureau of Land Management boundary) in 1993 using the Nez Perce basin-wide methodology. During the survey, approximately 69 percent of its length was classified as a B type stream channel. The remaining portion was classified as C and A channel types, 24 percent and 7 percent, respectively

The Forest Service and Bureau of Land Management have completed various stream improvement projects in the past, which include installation of rock check dams; log check dams, large woody debris, and habitat rock placement.

SUMMARY OF FISH SPECIES DISTRIBUTION

The American River area includes habitat for listed steelhead trout and bull trout.

TABLE 14. KNOWN AND SUSPECTED DISTRIBUTION OF TROUT, SALMON, AND CHAR IN AMERICAN RIVER

Stream Name	Westslope Cutthroat	Bull Trout	Spring Chinook	Steelhead	Brook Trout
(Middle) American River	Known Present	Known Present	Known Present	Known Present	Known Present
Upper American River	Known Present	Known Present	Known Present	Known Present	Known Present
East Fork American River	Known Present	Known Present	Known Present	Known Present	Known Present
Kirks Fork	Known Present	Known Present	Known Present	Probably Present	Status unknown
Whitaker Creek	Known Present	Probably Absent	Known Absent	Known Absent	Known Present
Queen Creek	Known Present	Probably Absent	Known Absent	Known Absent	Status unknown
Flint Creek	Known Present	Known Present	Known Present	Known Present	Known Present
Box Sing Creek	Known Present	Probably Absent	Known Present	Known Present	Probably Present
Lower American River	Known Present	Known Present	Known Present	Known Present	Known Present

EAST FORK AMERICAN RIVER – PRESCRIPTION WATERSHED -#17060305-05-10

East Fork American River flows into American River at river mile 10.6, and provides habitat for steelhead, bull trout, spring chinook salmon, westslope cutthroat trout, brook trout, mountain whitefish, sculpin, and dace. Bull trout use the stream for adult and sub adult rearing. Fish population surveys of the stream in recent years by Bureau of Land Management, Forest Service, and Idaho Department of Fish and Game (1996 – 2003) have documented the presence of bull trout, however, numbers were low and most fish were found in the middle reach. The stream may be used for bull trout spawning and early rearing, further investigations are needed for verification.

The lower reaches to mid reaches of the stream flow through a timbered bottom with some stringer meadows. A culvert installed at the mouth may be a partial/full fish passage barrier. A private residence occurs near the mouth. A trail parallels the creek. The lower reaches crossing Bureau of Land Management lands are not leased for grazing, however, Forest Service lands are permitted for grazing.

The East Fork American River was surveyed by the Bureau of Land Management in 1992 from the mouth to Forest Service boundary (stream mile 2.33). In 1993, the Forest Service surveyed from that point to the headwaters. Both surveys used a modified Hankin and Reeves survey methodology (Hankin and Reeves 1988).

The dominant channel type in lower reaches was B3, and unstable stream banks were 2 percent. The seven-day running average maximum temperature during steelhead and cutthroat spawning periods for East Fork American River is 13.4 degrees C, and is rated high (SM 0.1 – 1995). No data on rearing temperatures are available for the middle reach, but spot monitoring during fish surveys in 1998 found cool water temperatures, which rated high for steelhead and bull trout rearing. The seven-day running average maximum temperature for bull trout spawning was 14.4 degrees C, and is rated low (SM 0.1 – 1995). The seven-day running average maximum temperature for rearing is 16.1 degrees C, and is rated moderate for steelhead and low for bull trout (SM 0.1 – 1995). Primary limiting factors include high levels of deposited sediment and lack of good quality pools.

Recon surveys were conducted in 2003 in support of this project. The 2003 surveys included Rosgen stream channel classification with Wolman pebble count data (Rosgen, 1994), stream gradient and channel profiles. Cobble embeddedness was measured. R1 Stream Reach Inventory and Channel Stability Evaluation forms (Pfankuch, 1978) were completed and the Nez Perce Forest stream survey was also completed (USFS, 1995).

The Nez Perce Forest Plan established a fish/water quality objective for this watershed of 90 percent habitat potential. The Plan set the existing condition at 60 percent of potential, making this stream below its' Forest Plan objective. Reduced cattle grazing in the watershed has improved fish habitat conditions on the low gradient meadow reaches. High cobble embeddedness persists, pools are limited and poor in quality and acting woody debris is also below objective (Table 15).

KIRKS FORK – PRESCRIPTION WATERSHED -#17060305-05-11

Kirks Fork flows into American River at river mile 6.9, and provides habitat for steelhead, bull trout, spring chinook salmon, westslope cutthroat trout, brook trout, mountain whitefish, sculpin, and dace. Bull trout use the stream for adult and sub adult rearing. Fish population surveys of the stream in recent years by Bureau of Land Management, Forest Service, and Idaho Department of Fish and Game (1996 – 2003) have documented the presence of bull trout, however, numbers were low. A full fish passage barrier at all flows occurs at stream mile 2.3 (18 foot falls/cascades). The upper reaches of the stream consist of high quality westslope cutthroat trout habitat. The lower reaches receive moderate grazing use; and roads and logging have impacted the stream to varying levels.

The limited amount of management activities in this watershed and the high quality fish habitat is not reflected above with the Forest Plan showing this stream well below its' fish/water quality objective of 90 percent of habitat potential. The plan shows existing conditions at only 50 percent and actual conditions are likely higher.

A ford crosses the stream near the mouth. Bureau of Land Management monitoring of cobble embeddedness was 45 percent (stream mile 0.15 – 1995) and spawning gravels had 30 percent fines less than 6.3 mm (1995). Kirks Fork was surveyed by the Bureau of Land Management in 1992 from the mouth to Forest Service boundary (stream mile 0.55). The Forest Service surveyed from the Bureau of Land Management boundary upstream in 1991. Both surveys used a modified Hankin and Reeves (1988) survey methodology. The Nez Perce Forest fish habitat stream survey was completed in 2003.

The stream flows through a confined timbered stream bottom. The dominant channel type in lower reaches was B3 and average gradient ranged from 2-3 percent, and unstable stream banks varied from 3-5 percent. Bureau of Land Management data shows the seven-day running average maximum temperature during steelhead and cutthroat spawning periods for Kirks Fork is 13.9 degrees C, and is rated high (SM 0.05 – 1995). The seven-day running average maximum temperature for bull trout spawning was 14.8 degrees C, and is rated low (SM 0.05 – 1995). The seven-day running average maximum temperature for rearing was 16.7 degrees C, and was rated moderate for steelhead and low for bull trout (SM 0.05 – 1995). The 2003 water temperature data is displayed in Appendix B. Primary limiting factors include high levels of deposited sediment and lack of good quality pools.

The Nez Perce Forest Plan established a fish/water quality objective for this watershed of 90 percent habitat potential. The Plan set the existing condition at 50 percent of potential, making this stream below its' Forest Plan objective. The upper watershed has not been developed and the stream supports a strong population of westslope cutthroat trout in these upper reaches (D. Mays, Pre. comm.). It is likely that this stream exists at higher than 50 percent of potential as stated in the Plan. Elements like cobble embeddedness and percent surface fines indicate higher quality fish habitat (Table 15)

WHITAKER CREEK – PRESCRIPTION WATERSHED -#17060305-05-12

Whitaker Creek flows into American River at river mile 8.5, and provides habitat for cutthroat trout brook trout, dace and sculpin (Final Report YA-515-IA7-15, University of Idaho, 1978). Dredge mining has altered the mouth of the stream leaving no above ground channel for the stream. The stream flow enters American River sub-surface thus isolating the fish populations above. Roads, logging, and mining have impacted the stream to varying levels. Two private residences occur at the mouth of the creek. Extensive private land timber harvest has recently (2003) impacted the watershed.

The Bureau of Land Management surveyed Whitaker Creek in 1991 from the mouth to Forest Service boundary (stream mile 1.5) using a modified Hankin and Reeves (1988) survey methodology. The Forest Service surveyed their lands upstream in 1989 using the same methodology. Surveys were conducted for this analysis in 2003. The surveys included R1 Stream Reach Inventory and Channel Stability Evaluation (Pfankuch, 1978), and Fish Habitat Reconnaissance Survey (USFS, 2000). The Bureau of Land Management has completed surveys from the mouth to the headwaters in 2004.

The stream flows through a confined timbered stream bottom. The channel types starting from the mouth are C3 (short mouth area reach), B4, and A3; and average gradient ranges from 1 to 12 percent, and unstable stream banks were less than 3 percent. Primary limiting factors include high levels of deposited sediment, lack of good quality pools, and low flows.

The Nez Perce Forest Plan established a fish/water quality objective for this watershed of 70 percent habitat potential. The Plan set the existing condition at 70 percent of potential. Habitat elements of cobble embeddedness and pool to riffle ratio remain in poor condition (Table 15).

QUEEN CREEK – PRESCRIPTION WATERSHED -#17060305-05-13

Queen Creek flows into American River at river mile 9.4, and provides habitat for cutthroat trout. Dredge mining has altered the mouth area and the stream flows into a dredge pond and has no connecting channel with American River. The stream flows subsurface through dredge tailings into American River thus isolating the westslope cutthroat population. This stream was electro-fished in 2003, 22 westslope cutthroat and 6 dace were identified in a 23 square meter reach. Mining, roads, and logging have impacted the stream to varying levels.

The Bureau of Land Management surveyed Queen Creek in 1991 and again in 2004 from the mouth to the headwaters using a modified Hankin and Reeves (1988) survey methodology. The Forest Service surveyed from the Bureau of Land Management upstream in 1989. Recon surveys were completed for this project in 2003, these surveys included a Stream Reach Reconnaissance Survey (USFS, 2000), R1 Stream Reach Inventory and Channel Stability Evaluation (Pfankuch, 1978), Rosgen Stream Channel Classification with Wolman pebble count and channel profiles (Rosgen, 1994), and cobble embeddedness measurements.

The stream flows through a wide valley bottom at the mouth, while upstream reaches flow through a confined timbered stream bottom. The channel types starting from the mouth are C2 (mouth area), B3, and A3; and average gradient ranges from 2-7 percent, and unstable stream banks were less than 3 percent. Primary limiting factors include high levels of deposited sediment, lack of good quality pools, and low flows.

The lower miles of Queen Creek indicate that there has been a moderate level of disturbance from past dredge mining and placer mining activities. Tailing piles are scattered in small piles across the valley floor, and an old access road parallels the stream on the North side. Both Queen Creek and Whitaker Creek offer unique opportunities to study isolated populations of westslope cutthroat trout. These paired watersheds are similar in size and share a history of land disturbing activities.

The Nez Perce Forest Plan established a fish/water quality objective for this watershed of 70 percent habitat potential. The Plan set the existing condition at 70 percent. Habitat elements in Table 15 below indicate this stream is likely at 70 percent of habitat potential.

FLINT CREEK – PRESCRIPTION WATERSHED -#17060305-05-14

Flint Creek is a third order tributary of the East Fork American River. Flint Creek enters East Fork American River from the North approximately 2 miles upstream of the confluence East Fork American River and American River. Flint Creek is a low (0.5 percent) to moderate (4 percent-6 percent) gradient stream. Flint Creek is primarily characterized as being Rosgen stream types “B” and “C” with most channel slope gradients ranging from 0.5 percent to 7 percent. There are a few short sections of stream type “A” in the upper headwaters of the stream. The stream flows through a “U” shaped valley formation. The upslope environment consists of moderately steep (30-45 percent) mid elevation granitic uplands.

Historic stream surveys from 1970 and 1982 indicated that there had been a high level of livestock grazing disturbance within the Flint Creek drainage. The grazing strategies implemented as a result of the steelhead trout being listed under ESA have improved stream bank stability in Flint Creek. The drainage has also had large fire events in the 1800’s and early 1900’s. The Flint Creek Trail (Forest Service Trail #832) parallels the stream beginning approximately 0.75 miles upstream of the confluence with East Fork American River. Flint Creek supports westslope cutthroat and steelhead trout, bull trout, and spring/summer chinook salmon.

The Forest Service surveyed Flint Creek using the basinwide methodology in 1989. Recon surveys and basinwide surveys were conducted in 2003. In addition, The R1 Stream Reach Inventory and Channel Stability Evaluation, Rosgen Stream Channel Classification, and Cobble embeddedness were measured in support of the American and Crooked River Project. Primary limiting factors include high levels of deposited sediment and lack of good quality pools.

The Nez Perce Forest Plan established a fish/water quality objective for this watershed of 90 percent habitat potential. The Plan set the existing condition at 40 percent of potential, making this stream below its' Forest Plan objective. Reduced cattle grazing in the watershed has improved fish habitat conditions on the low gradient meadow reaches. High cobble embeddedness persists, pools are limited and poor in quality and acting woody debris is also below objective (Table 15).

BOX SING CREEK - PRESCRIPTION WATERSHED -#17060305-05-15

Box Sing Creek flows into American River at river mile 8.5, and provides habitat for steelhead and cutthroat trout. Dredge mining has altered the mouth area of the stream and the lower segment flows across the dredge mined stream bottom of American River. Livestock grazing occurs in the lower reaches; and roads and logging have impacted the stream to varying levels. A ford crosses the stream near the mouth.

The Bureau of Land Management surveyed Box Sing Creek in 1991 from the mouth to Forest Service boundary (stream mile 0.67) using a modified Hankin and Reeves (1988) survey methodology. The Forest Service surveyed the upstream reaches using the same methodology in 1989. Recon surveys were conducted in 2003 in support to this project. Surveys included Stream Reach Reconnaissance Survey (USFS, 2000), Rosgen Stream Channel Classification with channel profiles, Wolman pebble count (Rosgen, 1994), R1 Stream Reach Inventory, and Channel Stability Evaluation (Pfankuch, 1978).

The stream flows through a confined timbered stream bottom. The dominant channel type in lower reaches was B4 and average gradient was 2 percent, unstable stream banks were less than 3 percent. Primary limiting factors include high levels of deposited sediment, lack of good quality pools, and low flows.

Box Sing is approximately 5.7 miles long. The lower 2.0 miles of Box Sing Creek indicate a moderate level of disturbance from past dredge mining and placer mining activities. Tailing piles are scattered in small piles across the valley floor, and an old access road parallels the stream on the North side.

The Nez Perce Forest Plan established a fish/water quality objective for this watershed of 70 percent habitat potential. The Plan set the existing condition at 70 percent. Habitat elements in Table 15 below indicate low pool to riffle ratio and a stream lacking in acting woody debris.

SUMMARY

Below is a summary of conditions observed by both the BLM and FS for streams affected by this action. Whitaker Creek and Queen Creek do not support steelhead and therefore percent surface fines were not measured. All of the project area streams in American River accept Whitaker Creek and Queen Creek are below their Forest Plan fish/water quality objectives. Project activities include road decommissioning and culvert replacements that reduce non-point sediment sources in these systems. Winter rearing habitat has been identified as the primary limiting factor in these systems.

TABLE 15. AMERICAN RIVER EXISTING CONDITION OF FISH HABITAT INDICATORS COMPARED TO OBJECTIVES

Prescription Watershed	Cobble Embeddedness % (Forest Plan BO standard)		Pool:Riffle Ratio (DFC Standard)		Acting Large Woody Debris/ pieces per 100m (DFC Standard)		Percent Surface Fines (Steelhead/Bull Trout Matrix Standard)	
	Objective	Existing	Objective	Existing	Objective	Existing	Objective	Existing
Upper American River 17060305-05-09	<30	51	45:55	13:87	45	18	≤20	18
Lower American River 17060305-05-16	<30	31	45:55	20:80	45	2	≤20	8
East Fork American River 17060305-05-10	<30	40	45:55	20:80	45	28	≤20	51
Kirks Fork 17060305-05-11	<30	32	45:55	33:67	45	33	≤20	22
Whitaker Creek 17060305-05-12	<40	61	30:70	5:95	35	51	NA[1]	30
Queen Creek 17060305-05-13	<40	42	30:70	9:91	35	63	NA1	20
Flint Creek 17060305-05-14	<30	58	45:55	20:80	45	20	≤20	20
Box Sing Creek 17060305-05-15	<40	44	30:70	7:93	35	12	≤20	28

DEPOSITED SEDIMENT (COBBLE EMBEDDEDNESS AND PERCENT FINES)

TABLE 16. EXISTING CONDITION OF SELECT FISHSED VARIABLES, WHICH ARE RELEVANT TO THE DEPOSITED SEDIMENT INDICATOR

Watershed Name	Existing Cobble Embeddedness (%)	Existing Summer Rearing Capacity (Percent of Optimal)	Existing Winter Rearing Capacity (Percent of Optimal)
Upper American River	51	83	27
(Middle) American River	50	83	27
Lower American River	31	94	45
East Fork American River	40	89	35
Kirks Fork	32	93	44
Whitaker Creek	61	75	20
Queen Creek	42	88	34
Flint Creek	58	77	22
Box Sing Creek	44	87	32

[1] Steelhead do not currently use this system.

CROOKED RIVER

The watershed encompasses an area of approximately 45,659 acres with important aquatic values. Crooked River has been significantly affected by human activities primarily in the lower section (Lower Crooked River, Relief Creek and Middle Crooked River). The predominant feature is the historic dredge mining along and through the mainstem river, which has highly altered riparian processes and function. A streamside road for most of its length further affects the mainstem of Crooked River. This streamside road encroaches on riparian and stream process for about half of its length. The upper half of the watershed is mostly unroaded with reaches in the upper watershed supporting strong populations of westslope cutthroat trout and bull trout at some of the highest densities in the sub basin. Steelhead spawning and juvenile rearing primarily occurs in the mainstem and the lower 0.5 miles of each fork of Crooked River. The East and West Forks of Crooked River are in nearly pristine condition.

Crooked River is considered a stronghold for westslope cutthroat, a habitat stronghold for bull trout, and a historic stronghold for spring chinook and steelhead (USDA 1998).

Although the aquatic habitat condition in the upper watershed is good, the overall condition of this watershed is considered low. Crooked River is considered well below its 90 percent Forest Plan fish/water quality objective condition (USDA 1998).

Habitat complexity has been greatly reduced from the historic mining activities. Road 233 parallels a 3.4 mile section of stream, within a narrow canyon. This road has reduced the large woody debris recruitment in this stretch of stream. Because of reduced habitat complexity and elevated cobble embeddedness levels, summer rearing and over wintering conditions are believed to be the limiting factors for fish.

The Nez Perce National Forest with funding provided by the Bonneville Power Administration added approximately 400 habitat improvement structures in Crooked River during the 1980s (P. Siddall, 1992).. About 30 percent of these are still functioning as intended (Clearwater BioStudies, Inc., 1990) and provide improved fish habitat in many areas. Crooked River has been subject to intensive monitoring (Intensive Evaluation and Monitoring of Chinook Salmon and Steelhead Trout Production, Crooked River and Upper Salmon River Sites, BPA 1995 Annual Report). In this work IDFG fisheries biologist Russ Kiefer makes the following observations:

- *Our research indicates that in streams degraded by dredge mining, connecting off-channel ponds to the stream can increase the carrying capacity for chinook salmon parr (Kiefer and Forster, 1991), and complex instream structures can increase the carrying capacity for steelhead trout parr (Kiefer and Lockhart, 1995a).*
- *We observed a shift in spawning areas by adult chinook salmon to cleaner gravel areas produced by habitat rehabilitation structures in Crooked River (Kiefer and Lockhart, 1993). In streams with more than 30% sand in spawning areas, habitat structures that collect cleaner gravel with less than 30% should increase smolt production.*
- *Complex habitat enhancement structures apparently can increase the carrying capacity for age-1+ steelhead trout in streams with low habitat complexity. Dredge mining has reduced the habitat complexity in the upper meadow section of Crooked River (Middle Crooked River) by forcing the channel against the canyon wall on the east side of the meadow. We observed more than double the density of age-1+ steelhead in complex habitat study sites than we observed in control or simple sill log habitat sites in 1992 (Kiefer and Lockhart, 1995).*

This project will include activities designed to improve existing habitat enhancement structures, add additional structures, improve side channels connecting ponds, and further improve riparian and stream conditions impacted by past mining activities. While these activities represent the greatest short term risks to listed fish, they also represent proven ways to achieve an upward trend in fish/water quality, leading to increased carrying capacity for steelhead and bull trout.

The aquatic habitat condition in the upper watershed is good, supporting strong populations of westslope cutthroat trout, and bull trout at some of the highest densities in the sub basin. Although the habitat condition of the mainstem is low, it continues to support steelhead and spring chinook. Brook trout, present primarily in the upper West Fork and in the lower mainstem, pose a risk to downstream bull trout and westslope cutthroat trout (USDA 1998).

Idaho Department of Fish and Game Facilities: A weir and fish-trapping facility, part of the Lower Snake River Compensation Project, are located on Crooked River approximately ½ mile upstream from the mouth. A rearing facility with acclimation ponds and a settling pond for wastes is approximately 10 miles further upstream. These activities are being covered in a separate consultation and are not evaluated in this document.

SUMMARY OF FISH SPECIES DISTRIBUTION

The Crooked River area includes habitat for listed steelhead/redband trout and for listed bull trout. Steelhead trout are present in all of the watersheds. Bull trout have been observed in Lower and Middle Crooked River, Relief Creek and Silver Creek. They also use the South Fork Clearwater River for migration and rearing during periods of the year. FEIS Map 8a and 8b display fish distribution within the analysis area.

TABLE 17. KNOWN AND SUSPECTED DISTRIBUTION OF TROUT, SALMON AND CHAR IN CROOKED RIVER

Stream Name	Westslope Cutthroat	Bull Trout	Spring Chinook	Steelhead	Brook Trout
Lower Crooked River	Known Present	Known Present	Known Present	Known Present	Known Present
Relief Creek	Known Present	Known Present	Known Present	Known Present	Known Present
Middle Crooked River	Known Present	Known Present	Known Present	Known Present	Known Present
Silver Creek	Known Present	Known Present	Probably Present	Known Present	Status unknown
Quartz Creek	Known Present	Probably Absent	Probably Present	Known Present	Status unknown

LOWER CROOKED RIVER PRESCRIPTION WATERSHED #17060305-03-01

Landforms associated with Lower Crooked River suggest that the stream should be a Rosgen stream type "C". Observations indicate that Lower Crooked River should have a well-developed floodplain, be a slightly entrenched stream and be relatively sinuous with channel slopes of 2 percent or less. Historical mining disturbance has altered floodplain development, indicated by the presence of large mine tailings dispersed haphazardly across the valley floor.

The Lower Crooked River sub watershed is 9487 acres in size and includes the mainstem of Crooked River and sixteen 1st order tributaries, five 2nd order tributaries and two 3rd order tributaries. Included in these tributaries are unnamed streams referred to in this document as Section 11 and Section 14.

The Nez Perce Forest Plan established a fish/water quality objective for this watershed of 90 percent habitat potential. The Plan set the existing condition at 50 percent of potential, making this stream below its' Forest Plan objective (Table 18). High cobble embeddedness persists. Large pools have been created at the meander bends by past dredge mining. These pools are sand bottom with little to no cover. Acting woody debris is very limited in this reach. Bank cover and potential woody debris are also very limited

RELIEF CREEK – PRESCRIPTION WATERSHED #17060305-03-03

Relief Creek is a low gradient stream encompassing 7475 acres. Relief Creek enters Middle Crooked River 6.8 miles upstream of the confluence of Crooked River and South Fork Clearwater River. Relief Creek from its confluence with Crooked River upstream approximately 1.4 miles is a low relief stream that has been highly disturbed by dredge mining activities. The mine tailings from dredge activities were dispersed entirely across the valley floor. Often the tailings were mechanically piled to form long continuous pilings along one side of the valley floor or the other. These piles are approximately 10 feet high and have literally cut off the upslope drainage characteristics of the lower reaches of Relief Creek. This disturbance activity has likely interrupted the natural water yield and timing of the drainage. During the mechanical piling process the tailings located adjacent to the stream were heavily compacted resulting in a loss of vegetation along the stream banks, as well as, a loss of stream channel sinuosity. Floodplain development has also been interrupted because of the high level of disturbance associated with the dredge mining activities. Presently the lower reach of Relief Creek is a Rosgen stream type "B". Road construction and timber harvest activities have resulted in high levels of cobble embeddedness, and depositional filling of the pool areas.

In 1989, approximately 200+ rock and log weirs were installed in Relief Creek from the mouth of Relief Creek upstream to the confluence of the East Fork Relief (1.4 miles). The objective of this fish habitat improvement program included creation of pool habitat, establishment of flows conducive to deposition of cobbles suitable for spawning and improved sediment transport capabilities. During the 2003 field season, a preliminary field review indicates that most of the rock structures have been altered by high flows. The log structures are still in place according to the original design and placement and are creating some additional scour pools. The existing high numbers of acting debris are associated with these improvement structures.

Surveys in support of this project were conducted in 2003, including a Stream Reach Reconnaissance Survey, Nez Perce Forest Fish Habitat Survey, Rosgen Stream Channel

Classification, cobble embeddedness, and R1 Stream Reach Inventory and Channel Stability Evaluation. The water temperature data is displayed in Appendix B. The Nez Perce Forest Plan established a fish/water quality objective for this watershed of 90 percent habitat potential. The Plan set the existing condition at 60 percent of potential, making this stream below its' Forest Plan objective. Habitat alteration from historic mining combined with high levels of fine sediment and loss of connectivity are primary limiting factors in Relief Creek. This project is designed to improve conditions tied to these elements.

MIDDLE CROOKED RIVER – PRESCRIPTION WATERSHED - #17060305-03-04

This prescription watershed includes the mainstem of Crooked River from the top of the narrows to Orogrande. This is not a true watershed; true watersheds include all lands draining through a stream reach. This prescription watershed drains only the center lands of the Crooked River watershed. Several named tributaries enter Crooked River through this section including Sawmill, Silver, Quartz, Baker Gulch, Rainbow Gulch, Five Mile, and Umatilla Creeks. A short summary of each of the tributaries affected by this action is included below. The existing condition DFC and RMO analysis is based on mainstem Crooked River fish habitat conditions surveyed in 1990 as well as recon surveys conducted in 2003. Stream survey information gathered in 2003 will describe conditions in Silver Creek and Quartz Creek. Forest Plan Appendix A (Appendix B) has identified Middle Crooked River as meeting its objective with habitat conditions at 90 percent of optimum. This is likely an error in the plan as it is well recognized that the dredge mining of the mainstem, combined with past roading and timber harvest, have simplified the fish habitat well below the 90 percent level, as identified below (Table 18). This project is designed to increase stream complexity and improve instream habitat for fish.

SAWMILL CREEK

Sawmill Creek enters Middle Crooked River 8.3 miles upstream of the confluence of Crooked River and the South Fork Clearwater River. Sawmill Creek is 1.89 miles long and can be characterized as a Rosgen "B" stream type. The R1 Stream Reach Inventory and Channel Stability Evaluation (Pfankuch, 1978) found this stream in "fair" condition, cobble embeddedness was estimated at 40 percent, and water temperature was 12 degrees centigrade on July 15 at 1130 hours. No fish were observed in this small stream.

SILVER CREEK

Silver Creek is a moderate to high gradient stream entering Crooked River 9.2 miles upstream of the confluence of Crooked River with South Fork Clearwater River. Silver Creek is characterized as a Rosgen stream type "B" with channel slope gradients ranging from 1.5 to 5 percent. There are a few short sections of stream type "C" in the lower 2.0 miles of the stream, and some relatively short sections of stream type "A" in the middle to upper portions of the watershed. Silver Creek supports steelhead and bull trout. The upper reaches support a strong westslope cutthroat trout population (D. Mays, per. comm.). Surveys in support of this project were conducted in 2003, including a Stream Reach Reconnaissance Survey (USFS,2000), Nez Perce Forest Fish Habitat Survey (USFS, 1995), Rosgen Stream Channel Classification (Rosgen, 1994), cobble embeddedness, and R1 Stream Reach Inventory and Channel Stability Evaluation (Pfankuch, 1978). Fish habitat is limited by increased fine sediment and poor quality pool habitat.

QUARTZ CREEK

Quartz Creek is a low (2 percent) to high (4-20 percent) gradient stream entering Crooked River 10.2 miles upstream of the confluence of Crooked River with South Fork Clearwater River. Quartz Creek can be primarily characterized as a Rosgen stream type "B" with short sections of stream type "C" in the upper headwaters of the stream, and some relatively short sections of stream type "A" in the middle to upper portions of the watershed Surveys in support of this project were conducted in 2003, including a Stream Reach Reconnaissance Survey (USFS, 2000), Nez Perce Forest Fish Habitat Survey (USFS, 1995), Rosgen Stream Channel Classification (Rosgen, 1994), cobble embeddedness, and R1 Stream Reach Inventory and Channel Stability Evaluation (Pfankuch, 1978).

Quartz Creek has experienced a history of mining and logging activities. The lower reach is privately owned, supporting several seasonal/full time residences. The stream inventories identified both channel degradation and aggradation occurring within various reaches of the stream. The historic mining disturbance, coupled with past timber harvest activities within the drainage, appear to have contributed to channel degradation through accelerated bank erosion, increased sediment supply and decreased sediment transport capabilities.

Below is a summary of the conditions inventoried for Crooked River streams affected by this action.

TABLE 18. CROOKED RIVER EXISTING CONDITION OF FISH HABITAT INDICATORS COMPARED TO OBJECTIVES

Prescription Watershed	Cobble Embeddedness % (Forest Plan BO standard)		Pool:Riffle Ratio (DFC Standard)		Acting Large Woody Debris/ pieces per 100m (DFC Standard)		Percent Surface Fines (Steelhead/Bull Trout Matrix Standard)	
	Objective	Existing	Objective	Existing	Objective	Existing	Objective	Existing
Lower Crooked River 17060305-03-01	<30	80	45:55	13:87	45	8	≤20	Not available
Relief Creek 17060305-03-03	<30	55	45:55	21:79	45	51	≤20	55
Middle Crooked River 17060305-03-04	<30	35	45:55	36:64	45	6	≤20	Not Available
Silver Creek[1]	<30	55	45:55	56:44	45	87	≤20	15
Quartz Creek[1]	<30	49	45:55	23:77	45	75	≤20	15

[1] These streams are not prescription watersheds, although they are true watersheds.

TABLE 19. EXISTING CONDITION OF SELECT FISHSED VARIABLES, WHICH ARE RELEVANT TO THE DEPOSITED SEDIMENT INDICATOR

Watershed Name	Existing Cobble Embeddedness (%)	Existing Summer Rearing Capacity (Percent of Optimal)	Existing Winter Rearing Capacity (Percent of Optimal)
Lower Crooked River	80[1]	56	12
Relief Creek	55	80	24
Middle Crooked River	35	92	40
Silver Creek	55	80	24
Quartz Creek	49	84	28

ANALYSIS OF EFFECTS

SEDIMENT/SUBSTRATE ANALYSIS

Existing measured or estimated cobble embeddedness in analysis area streams was also used to estimate summer and winter rearing capacities for trout and salmon, using the FISHSED model (Stowell et al. 1983). The FISHSED model was then used to display changes to fish habitat resulting from the American and Crooked River Project and compare the action to existing conditions using both existing cobble embeddedness measurements and predictions of NEZSED. The limitations of both the NEZSED and FISHSED models are detailed in Appendix B. These elements were used to roughly predict amount of change in summer and winter rearing capacity using mathematical relationships in the FISHSED model. These changes were calculated for all alternatives and are an indication of the amount of sediment expected as a result of surface sediment erosion. Sediment from sources other than surface sediment erosion, including bank erosion, mass movement (landslides), and watershed and stream improvements are not included in model estimates.

The FISHSED model includes calculations for fish embryo survival, summer rearing capacity, and winter rearing capacity. Fish embryo survival is an estimate of predicted fine sediment by depth in cobble stream bottoms. Summer and winter rearing capacity reflect how the degree of fine sediment in the stream bottom affects the stream's ability to support fish during these seasons. For the American and Crooked River analysis, the model was not used to estimate changes in embryo survival because percent fine by depth data, which are substrate core data measurements, were not available. In general, the Nez Perce National Forest has not collected substrate core data since the late 1980s. One reason these data are no longer collected is research published in 1988 suggested modeling embryo survival in egg pockets does not accurately reflect conditions faced by embryos or emerging fry in real-life stream situations (Chapman, 1988).

Model results, as displayed below in Tables 20-25 are reasonable estimates and not absolute numbers with high statistical precision. The capability of the FISHSED model in analyzing and

[1] Channel highly altered by historic mining.

displaying change at the levels shown in these tables is somewhat limited. In this case, data from FISHSED are most useful in comparing the relative effects among alternatives. The model also reflects short-term changes only and does not show the long term recovery, projected in NEZSED

For the purposes of this modeling exercise, the two sediment peaks in the next decade predicted by NEZSED were combined into one peak, as if all sediment would be delivered to the streams in the same year. Combining these two peaks reflects the additive nature of cumulative sediment effects that occur over a relatively short period of time. In a sense, this is a “worst case scenario”, in that these sediment peaks would not occur all in one year, and a measure of recovery may occur between peaks. Sediment transport capabilities in streams, however, depend on channel factors such as bed roughness, gradient, stream flow, and sinuosity.

All modeling was conducted for age 0+ steelhead trout. The data shown for Alternative A is the existing condition. Cobble embeddedness was measured in most streams and estimated in others.

The analysis of effects on fish resources from increased sediment is based on the Watershed analysis of sediment in the Watershed section above and in Appendix B. The model results displayed below in Tables 20-25 display existing conditions with high cobble embeddedness and poor winter rearing capacity. The results of FISHSED show slight increases in cobble embeddedness and corresponding decreases in percent of optimum summer and winter rearing capacity for all fish-bearing streams. Modeled activities include temporary road construction, road reconstruction, timber harvest and road decommissioning. It does not include site treatments for watershed restoration, instream fish habitat improvements, and roadside salvage. The following numbers have been modified to reflect recent changes.

To better view the upward trend for sediment/substrate, please refer to Appendix B Sediment Yield Graphs and the Aquatic Trend Analysis.

American River

Table 20. Comparison of Predicted Cobble Embeddedness (CE) by Alternative

Stream/Composite	A	D	D additional
Middle American River	50	52	52
East Fork American River	40	43	43
Flint Creek	47	49	49
Whitaker Creek	61	64	64
Queen Creek	42	47	46
Box Sing Creek	44	47	46
Kirks Fork	32	33	33
Lower American River	31	34	34

TABLE 21. COMPARISON OF SUMMER REARING CAPACITY (SRC) BY ALTERNATIVE

Stream/Composite	A	D	D additional
Middle American River	83	82	82
East Fork American River	89	88	88
Flint Creek	85	84	84
Whitaker Creek	75	72	72
Queen Creek	88	85	86
Box Sing Creek	87	85	86
Kirks Fork	93	93	93
Lower American River	94	93	93

TABLE 22. COMPARISON OF WINTER REARING CAPACITY (WRC) BY ALTERNATIVE

Stream/Composite	A	D	D additional
Middle American River	27	26	26
East Fork American River	35	33	33
Flint Creek	29	28	28
Whitaker Creek	20	19	19
Queen Creek	34	29	30
Box Sing Creek	32	29	29
Kirks Fork	44	43	43
Lower American River	45	42	42

CROOKED RIVER

TABLE 23. COMPARISON OF PREDICTED COBBLE EMBEDDEDNESS (CE) BY ALTERNATIVE

Stream/Composite	A	D	D additional
Middle Crooked River	35	36	36
Quartz Creek	49	50	50
Silver Creek	55	59	58
Relief Creek	55	56	56
Lower Crooked River (Highly altered by past mining)	80	82	82

TABLE 24. COMPARISON OF SUMMER REARING CAPACITY (SRC) BY ALTERNATIVE

Stream/Composite	A	D	D additional
Middle Crooked River	92	91	91
Quartz Creek	84	83	83
Silver Creek	80	77	77
Relief Creek	80	79	79
Lower Crooked River	56	54	54

TABLE 25. COMPARISON OF WINTER REARING CAPACITY (WRC) BY ALTERNATIVE

Stream/Composite	A	D	D additional
Middle Crooked River	40	40	40
Quartz Creek	28	27	27
Silver Creek	24	22	22
Relief Creek	24	22	23
Lower Crooked River	12	12	12

Predicted increases are not at a magnitude where measurable changes would be expected to occur. All increases, as modeled, are all within the margin of error for the model. The FISHSED analysis and the numbers above do show a trend. There is a slight difference between Alternative A (no action) and the action alternatives, reflecting the short term spike from the actions, not including the restoration activities.

The basic model assumption behind FISHSED is that an inverse relationship exists between the amount of fine sediments in spawning and rearing habitats and fish survival and abundance. In general, when sediment yields are increased over natural rates in Idaho batholith watersheds, especially on a sustained basis, fish biomass decreases. Fine sediment is known to degrade salmonid spawning and rearing habitat (Chapman and McCleod, 1987; Bjornn and Reiser, 1991), as suggested by the FISHSED model. Specifically, high sediment levels can impair habitat for spawning and rearing by: (1) trapping fry in redds when they are attempting to emerge; (2) depleting intergravel oxygen levels in redds, smothering eggs contained within; (3) limiting aquatic invertebrate populations used a food source; (4) filling and thereby reducing the number of large pools which serve as primary feeding and resting areas for juvenile salmonids; and (5) filling spaces between rocks that serve as over wintering refuge for juvenile salmonids (NMFS Biological Opinion, 1998). We expect that changes in substrate condition from (modeled) increased surface sediment yield are not of a magnitude that effects on fish would occur. Although, recent findings suggest that there is no threshold below which increased fine-sediment delivery will be harmless (Suttle, 2004). That same study found that sediment reduction could produce immediate benefits for salmonid restoration. When combining the modeled activities with the instream improvements, increased sediment is likely.

An important concept in assessing effects on fish habitat from increases in surface sediment erosion for this project is that both the FISHSED and NEZSED models represent peak sediment yields, which in this case are temporary, with a final result of reduced road density and improvement in the existing baseline condition. The consequence of long-term improvement in watershed condition is a short-term increase, or pulse, in surface sediment yield, which must occur in order for the long-term goal of improvement to occur. Roads cannot be obliterated, and vegetation treatments cannot occur, without a pulse of sediment. Short-term risks of increased sediment yields should be considered in the context of long-term improvement in watershed and stream habitat condition.

WATERSHED AND STREAM RESTORATION

It is clear from the above tables that modeled sediment increases are not at a level of high concern to fish and fish habitat. What is also evident is that existing conditions are well below what is desired. This project includes activities designed to improve conditions for fish. These activities are not modeled. The short-term sediment increases expected from these actions especially riparian and instream work in Crooked River, could introduce streambed and stream bank sediments to a degree that could affect listed and sensitive fish. This short term increase in sediment yield is necessary to achieve a long-term improvement in fish habitat.

For a complete listing of the activities covered in this section, please see Tables 1 and 2 above, and Appendix A. In general, these actions are associated with areas within streamside riparian areas. In-channel work is planned for up to 14.6 miles of stream. Listed (ESA) fish are present in the area. The in channel disturbance from this work would cause sediment to be reintroduced. This short-term impact must be weighed against the long-term benefit as illustrated above with road obliteration. The NEZSED model is not designed for use with this type of project.

Mitigation measures are designed to minimize the short-term sediment being introduced. Aquatic specialists on the Forest would review project designs for all activities planned under this section. Forest personnel would monitor the implementation and effectiveness of this work.

In-channel activities may also result in disturbance to individual fish, both within the immediate work area and downstream. Increased turbidity during work may locally affect individual fish but would not be at a magnitude where serious harm or mortality would occur. Timing restrictions for in-channel work would result in avoidance of spawning fish or redds. A detailed analysis of restoration activities and the resulting upward trend is included in Appendix B.

LARGE WOODY DEBRIS ANALYSIS

Large woody debris (LWD) is a component of habitat quality and complexity and is also an important contributor to stream productivity, cover, and food production for fish and other aquatic organisms. Large wood in the streams also contributes to channel stability in small, low order streams, and is thus an important element even in streams where fish are not present. Under natural conditions, large wood is contributed to streams from the surrounding riparian areas as trees fall over and may be recruited either discretely (one or two here and there) or in large numbers over a short period of time. The latter often occurs in response to a significant disturbance event, such as wildfire or an extreme weather event where floods or debris torrents wash large amounts of material into the stream. The existence of debris jams in streams is generally evidence of a past event of this type.

The amount of large woody debris in a stream is usually measured in the field during stream surveys by counting the number of large woody pieces present in the stream. Future woody debris recruitment is estimated by counting the number of trees in the riparian area that could fall into the stream.

Some stream reaches in the project area have been determined to be debris-deficient; most of these reaches occur in the streams that have been placer mined like mainstem American River and Crooked River as well as tributaries like Relief Creek.

AMERICAN RIVER

No timber harvest is proposed in streamside RHCAs, therefore no change is expected in potential woody debris.

CROOKED RIVER

Instream improvement work along with riparian improvements will greatly increase the numbers of both acting and potential large woody debris. The addition of LWD to 11.1 miles of mainstem Crooked River and Relief Creek will create more complex pool habitat leading to increased carrying capacity for listed fish.

POOL HABITAT ANALYSIS

Pool:riffle ratio is an indicator of habitat quality and complexity, both of which are important elements for salmonid fishes in streams. In addition, the quality of pools is an important consideration. Pool quality is generally indicated by pool volume and pool depth, with larger, deeper pools offering greater quality.

Stream survey data have provided estimates of the number and quality of pools for streams in the American and Crooked River area that have been surveyed. The summarized data present pool information as pool:riffle ratio, with a ratio of 50 percent or more pools as highly desirable.

The number of pools in a stream and the quality of those pools can be affected by: (1) long-term increases in sediment yield, a phenomenon that can result in pool-filling and eventual loss of the pool; (2) increased bedload accumulation that also results in pool-filling; and (3) lack of large woody debris and other pool-forming structures, which can significantly affect streams that are dependent on large wood as the primary pool-forming mechanism. Therefore, changes in sediment yield and the amount of large wood available to fall in the stream are indicators for predicting changes in the number and quality of pools over time, as well as number of trees felled or placed into streams. In addition, pools may be artificially created during channel restoration or other habitat improvement projects.

Sediment generated with these action alternatives would slightly impact pool habitat. Instream improvement projects would greatly increase both the number and quality (complexity) of pool habitat in Crooked River. Alternative D would require improvement work in 11.1 miles and allow for an additional 3.5 miles when funding becomes available. This work will be important in moving this stream toward its' Forest Plan objective. This work will be important in moving both Relief Creek and Crooked River toward their Forest Plan objective. Increasing the number and quality of pool habitat will also improve the carrying capacity for listed steelhead and bull trout.

AMERICAN RIVER

No instream improvement work is planned in American River. Pool habitats would be impacted slightly, in the short term, by deposited sediment. See sediment (FISHSED) analysis (Appendix B) for details. Watershed improvement projects and road obliteration work would reduce sediment sources and improve pool habitat over time.

Crooked River

Sediment generated with alternative D would slightly impact pool habitat. Instream improvement projects would greatly increase both the number and quality of pool habitat in Crooked River. Alternative D would improve pool habitat over 14.6 miles of stream. This work will be important in moving this stream toward its' Forest Plan objective as well as assisting in the recovery of listed, sensitive fish species. The Aquatic Trend Analysis (Appendix B) provides details of this analysis, supported by Russell Kiefer's work (IDFG Report Number 00-15 October) as reported to BPA in the Annual Progress Report (1995).

Water Yield Analysis

Equivalent Clearcut Area (ECA) is used as a tool to assess potential changes in water yield. ECA is discussed in more detail in the Watershed section. Increases in water yield may indirectly affect fish habitat through increased bank erosion, channel down cutting, increased accumulation of larger streambed materials, reduction in number of pools, and overall simplification of habitat.

ECA was calculated by prescription watershed. The calculations take into consideration effects of harvest and temporary road construction. Prescribed fire was assumed to not create additional ECA given the low severity objectives. Road decommissioning was not modeled as decreasing ECA even though the roads would recover vegetation over time. The ECA analysis does not include the effects of insect and disease agents.

Table 26 shows the estimated per year ECA for each prescription watershed in American River. Alternative A represents existing condition. Year 2005 represents the modeled peak activity year. ECA recovery begins the following year and occurs gradually from then on.

American River

The highest levels of ECA increase are found in Queen, Box Sing, and Whitaker Creeks, respectively. These are small prescription watersheds with channels that would be considered relatively sensitive to changes in watershed conditions. Queen Creek and Whitaker Creek do not support listed fish.

Road decommissioning and soil restoration would contribute to a reduction in compaction, thus improving infiltration and reducing surface runoff.

TABLE 26. PERCENT (%) ECA (2005)

Watershed Name	Area (mi^2)	Alt A (existing)	Alt D
Middle American River*	23.8	3	4
East Fork American River*	18.4	7	9
Flint Creek	9.2	8	12
Whitaker Creek	1.4	10	13
Queen Creek	1.7	13	18
Box Sing Creek	1.4	6	14
Kirks Fork	9.8	2	6
Lower American River*	91.6	9	10

*Composite watersheds were combined with upstream watersheds for ECA analysis

CROOKED RIVER

Among Forest Plan prescription watersheds, the highest ECA levels are found in Relief Creek. Though not Forest Plan prescription watersheds, Silver and Quartz Creeks were also evaluated separately. With the exception of Silver Creek, none exceed 20 percent ECA.

Road decommissioning and soil restoration would contribute to a reduction in compaction, thus improving infiltration and reducing surface runoff. Road miles of decommissioning and acres of soil restoration by prescription watershed are found in Appendix A.

TABLE 27. PERCENT (%) ECA BY ALTERNATIVE (2005)

Watershed Name	Area (mi^2)	Alt A (existing)	Alt D
Middle Crooked River*	44.8	2	5
Quartz Creek	4.1	2	8
Silver Creek	4.2	8	26
Relief Creek	11.7	8	15
Lower Crooked River*	71.3	5	8

*Composite watersheds were combined with upstream watersheds for ECA analysis

WATER QUALITY

TOXICS

Water Quality analysis includes introduction of toxic materials. We currently are proposing no tools for predicting the amount of toxic materials entering streams because we are implementing mitigation such that the risk of toxic materials entering streams is very low, and we do not expect a measurable effect from the use of these materials.

AMERICAN RIVER AND CROOKED RIVER

Toxic materials used under alternative D include herbicides and fossil fuel derivatives, including, diesel fuel, hydraulic fuel, various petroleum-based lubricants, and gasoline. The two factors determining the degree of risk from toxic materials are the toxicity of the chemical and the likelihood that non-target organisms would be exposed to toxic doses (Norris et al., 1991). Toxicity alone does not make a chemical hazardous; exposure to a toxic dose must also occur. Chemicals may enter water by one or more of the following routes: direct application, drift, and mobilization in ephemeral stream channels, overland flow, and leaching (Norris et al., 1991).

Since no aerial application of herbicides is proposed, and hand application of herbicides would be restricted in streamside RHCAs, all the above mechanisms for delivery to streams are unlikely to occur. Given constraints on application of herbicides, introduction of herbicides to water, particularly in concentrations necessary to elicit an effect on aquatic organisms, is highly unlikely.

In addition, fueling and storage of fuels is prohibited in RHCAs, unless fuels in the storage area are completely contained such that an accidental spill would not leach into soil or water. Transport of fuels is regulated through mitigation that minimizes the risk of accidents or accidental introduction of these materials to streams. Therefore, the risk of fuel delivery to streams is considered discountable (extremely unlikely to occur).

ESA consultation with NOAA Fisheries and USFWS, for application of herbicides, will be conducted annually on a project-by-project basis until programmatic consultation has been completed.

WATER TEMPERATURE

Potential increases in stream temperature are addressed by assessing the degree of activities in riparian areas that may result in increased or decreased solar radiation to streams. Appendix B provides information on existing water temperatures. Current water temperatures do not meet State Standards. See the Watershed section above for a detailed discussion of this element.

AMERICAN RIVER

Since harvest of timber within wetland and streamside RHCAs is not proposed, the risk of effect from timber harvest and road building on stream temperature is discountable, or extremely unlikely to occur.

CROOKED RIVER

Stream improvements included with this alternative include riparian planting to increase stream shade. It can be expected that overtime; this work could improve water temperatures. Alternative D provides for 14.6 miles of riparian and instream improvement.

HABITAT CONNECTIVITY/FISH PASSAGE

The ability for fish to move between habitats as conditions change and for individuals to move between fish populations is an important component for short-term survival and long-term population genetic diversity. Culvert improvement work associated with this action will focus on both increased culvert size for better passing of flood flows and movement of aquatic biota up and down stream.

Habitat connectivity will simply be a measure of increased stream miles displayed and perennial or intermittent stream miles above culvert improvements. Not all sites involve fish passage.

American River

The American and Crooked River project area offers' opportunities for increasing connectivity of fish populations. Future additions to this work include Queen, Whitaker, and Telephone Creeks in American River. Dredge mining has blocked access to these streams from the mainstem American River. Bureau of Land Management is currently proposing to connect these systems through their Eastside Project. Some culverts have been identified and are included with the restoration activities associated with this action. The additional 3 miles of accessible habitat will add to the improving trend in American River.

Table 28. American River miles of stream with improved access.

Alternative	Perennial	Intermittent
D	3	1.5

Crooked River

Projects include hardening of existing fords as well as replacing culverts to allow for high flows and passage of aquatic biota. Increasing connectivity allows individual fish to migrate in and out of tributaries to seek cool water. Increased connectivity also promotes genetic exchange between populations thus increasing diversity. This work will add to the improving trend in Crooked River.

Table 29. Crooked River miles of stream with improved access.

Alternative	Perennial	Intermittent
D	28.2	14.2

Cumulative Effects to Fish Habitat

The cumulative effects for fisheries resources include the effects of future State, tribal, or private actions that are reasonably certain to occur in the action area. The action area considered in this biological assessment is detailed above. Future Federal actions that are unrelated to the proposed action are not considered because they require separate consultation. There are numerous past, current, and future planned actions in the South Fork Clearwater subbasin. The South Fork Clearwater River is at high risk of cumulative sediment and temperature impacts.

The South Fork Clearwater River TMDL (see Watershed above) for sediment and water temperature will govern activities on State and private lands as well as Federal lands. Under this guidance, aquatic conditions should continue to improve in American River and Crooked River.

The selected alternative of the Bureau of Land Management's Whiskey South Project includes timber harvest, temporary road construction, and prescribed fire treatments in Lower Crooked River. These activities were evaluated for sediment yield and peak year ECA and the results for ECA are combined with those of the American/Crooked Project in Table 30 below:

TABLE 30. PERCENT (%) ECA FOR 2005 (INCLUDING WHISKEY SOUTH PROJECT)

Watershed Name	Area (mi^2)	Alt A (existing)	Alt D
Lower Crooked River*	71.3	5	9

*Composite watersheds were combined with upstream watersheds for ECA analysis

The addition of 243 acres of ECA from the Whiskey South Project increased the 2005 Lower Crooked River ECA by 1 percent in Alternative D.

SOUTH FORK CLEARWATER RIVER

Both American River and Crooked River, and the South Fork Clearwater River have been subject to a variety of natural and human-caused events in the past 200 years (USDA, 1998).

Findings for aquatic resources in American River, Crooked River, and the South Fork Clearwater River include substantial physical changes since the initiation of significant human disturbances in the 19th century. Specific activities include but are not limited to intensive in-channel mining, timber harvest throughout the sub basin, road construction and encroachment on streams, domestic livestock grazing, home construction and private land development, agriculture and cultivation, fire suppression, and many others. It is generally accepted that water quality and habitat in the South Fork Clearwater River is in a degraded condition, both from sediment and temperature impacts (USDA, 1998; USDA 1999).

Actions associated with the proposed projects may contribute to and/or reduce cumulative sediment in the South Fork Clearwater River downstream of project area, dependent on the analysis timeframe. The NEZSED model was used to calculate the predicted cumulative effects sediment yield based on the proposed timber harvest, road construction, road maintenance, and road reconstruction. As discussed in the Watershed Cumulative Effects section, these effects would be short-term only, and improvements in watershed condition over time would contribute to improved conditions in the river, assuming concurrent negative impacts do not occur off National Forest lands.

Several estimates of annual sediment yield have been made for the South Fork Clearwater River, generally covering the area upstream of the Forest Boundary at the Mt. Idaho Bridge (USDA Forest Service 1998, 1999 and IDEQ et al, 2004, page L-8). These estimates were made using two methods: 1) the NEZSED model; and 2) computations from suspended sediment samples collected during 1988 through 1992. The range of these estimates is from 14,600 to 17,800 tons/year. For purposes of comparing the alternatives, a figure of 16,000 tons/year is used. This is very close to the mean of the estimates. It is also very close to the figure computed in the South Fork Clearwater TMDL, when using NEZSED at the Forest Boundary. Thus, it forms a benchmark for the TMDL analysis.

Additional sediment yield from ongoing and foreseeable actions totals 170 tons/year. This is the combined peak year figure from the Meadow Face, Red Pines, and Whiskey South Projects. Thus, the benchmark figure to which the American/Crooked Project is compared is 16,170 tons/year.

The comparisons are done in terms of the sediment yield associated with a percent of the estimated annual sediment yield in the South Fork Clearwater River. The estimates are for routed sediment yield delivered from American and Crooked Rivers to the South Fork Clearwater River for the peak activity year of 2005 (Table 31).

TABLE 31: SEDIMENT YIELD FROM AMERICAN AND CROOKED RIVERS TO THE SOUTH FORK CLEARWATER RIVER

	Alt A (existing)	Alt D[1]	Alt D Discretionary
Alternative Generated Sediment Yield (tons/yr)	0	46	47
Alternative Generated Sediment Yield (% of SFCR)	0	0.3%	0.3%
Total Routed Sediment Yield (tons/yr)	902	947	948
Total Routed Sediment Yield (% of SFCR)	5.6	5.9	5.9

The amount of sediment estimated to be delivered to the main stem South Fork Clearwater River as a direct result of the action is 0.3 percent of the estimated annual yield of the river. When natural, alternative and pre-existing activity sediment are added, the estimated contribution from American and Crooked Rivers is 5.9 percent. This difference is relatively inconsequential, when considered in relation to the total sediment yield of the South Fork Clearwater River at the Forest Boundary.

If the Forest Plan guidance of upward trend in aquatic conditions for below objective watersheds is followed, along with the South Fork Clearwater River TMDLs for sediment and water temperature, aquatic conditions should continue to improve in the South Fork Clearwater River, when considered at the Forest Boundary near Mt. Idaho Bridge.

The following tables list known non-federal activities with completed ESA consultation within the South Fork Clearwater River and known non-federal activities. Cumulative effects for this consultation only consider non-federal actions.

[1] First figure includes required watershed improvement projects only; second figure includes required and discretionary watershed improvement projects

TABLE 32 – PROJECTS IN THE SOUTH FORK CLEARWATER RIVER ABOVE THE FOREST BOUNDARY

Forest Service Projects	Activity	Considered in Baseline Y/N
Blanco Burn[1]	1,000 acres of rehabilitation	Y
Red River Roadside Hazard	Pruning, precommercial thinning, brush and sapling removal to create defensible space within 200 feet of structures on FS land.	Y
Noxious Weed Program	Spot treatments of herbicide applications	Y
Crooked River Recreational Mining Activity	Placer Mining	Y
Meadow Face[2]	Aquatic and Terrestrial Restoration	Y
Red River DSP	Defensible space burning project	Y
Orogrande DSP	Defensible space burning project	Y
Newsome Town site DSP	Defensible space burning project	Y
Crooked River Demonstration	Thinning and pruning to reduce fuels	Y
806	Defensible space burning project	Y
Red River Road Surfacing		Y
Otter Wing TS	T.S.	Y
Blue Ridge Ridge[2]	Prescribed burning project	Y
McComas meadow burning[2]	Prescribed burning project	Y
South Fork Corridor	Prescribed burning project	Y
Red Pines EIS	Fuels Reduction	Y
Slims fire complex[1]	Catastrophic fire line restoration	Y
Lucky Marble	Fuels work	Y
East Fork Crooked River Bridge	New bridge construction	Y
Pet Site Mine		Y
Hungry Mill[2]		Y

[1] Above the mouth of Crooked/American – Upper South Fork
[2] Below the mouth of Crooked/American – Upper South Fork

TABLE 33 – STATE OF IDAHO PROJECTS

State of Idaho Projects	Activity	Time Period	Considered in the Baseline Y/N
School District Timber Sale	Timber removal on approximately 16 acres	Foreseeable Future	Y
Lower Red River Meadows Restoration [1]	Instream and riparian improvements	Ongoing	Y

TABLE 34 – NEZ PERCE TRIBAL PROJECTS

Nez Perce Tribal Projects	Activity	Time Period	Considered in the Baseline Y/N
Upper Red River	Culvert replacement	Foreseeable Future	Y
Mill Creek	Culvert replacement	Foreseeable Future	Y
Upper Newsome	Culvert replacement	Foreseeable Future	Y

TABLE 35 – PRIVATE LAND PROJECTS

Private Land Projects	Activity	Time Period	Considered in the Baseline Y/N
Bennett Logging	Timber removal on approximately 640 acres and roading	Past	Y
Logging on Private Land	Timber removal on approximately 100 acres and roading	Past	Y
Elk City Alliance	Thinning and pruning to reduce fuels	Ongoing	Y
Framing Our Community	Thinning and pruning to reduce fuels	Ongoing	Y

INTERRELATED AND INTERDEPENDENT EFFECTS

These are actions that are part of the larger action and dependent on the larger action for their justification (interrelated) and actions having no independent utility apart from the proposed action (interdependent).

There are no known interrelated or interdependent actions associated with the American and Crooked River Project.

[1] Above the mouth of Crooked/American – Upper South Fork

Determination

ESSENTIAL FISH HABITAT

Essential Fish Habitat (EFH) is designated for chinook and coho salmon in the Clearwater River HUC (170603). EFH habitat for coho is limited to the mainstem river. EFH for chinook includes areas historically accessible, which would include American River and Crooked River. Direct effects of the proposed project are expected to have short-term negative effects on spring chinook salmon EFH in these drainages.

The negative effects of the project are expected to be short term, resulting in an overall improvement to salmon habitat in both drainages. The project over time will reduce the risks of road failures and improve fish passage and habitat.

This project will have no measurable effects to the mainstem river or EFH for coho.

DETERMINATION OF EFFECT BY SPECIES

The determinations of effect for this project are displayed in the following table. The determination of effect on critical habitat is made for these activities because there is designated critical habitat for listed species in the project area. The determination of effect for redband is the same as for steelhead.

TABLE 36. DETERMINATION OF EFFECT BY SPECIES

Species	No Effect	Not Likely to Adversely Affect	Likely to Adversely Affect	May Affect Individuals but Not Likely to Cause a Trend to Federal Listing or Loss of Viability	Essential Fish Habitat/ Likely to Adversely Affect	Proposed Critical Habitat Likely to Adversely Affect
Fall Chinook	X					
Spring Chinook				X	X	
Steelhead/Redband			X			X
Bull Trout			X			
Westslope Cutthroat				X		
Lamprey				X (If Listed)		

DETERMINATION RATIONALE

SUMMARY

The use of herbicides within the project area is not covered under this BE/BA. Project specific consultation will be required with NOAA Fisheries and USFWS.

The success of restoring the watershed processes by decompacting soils, decommissioning roads, and instream and riparian improvements will depend on successfully implementing the projects and following up on the implementation monitoring.

The actions taking place must consider the fact that we are operating in priority watersheds for the recovery of the ESA listed steelhead trout and bull trout. There is a risk of possible take of these species relating to harm of individuals from instream and riparian improvements, and culvert replacements.

The short term degrade of the sediment yield indicator will be followed by a long term benefit or reduction in sediment yield as measured in NEZSED.

Increased connectivity by replacing undersized culverts will increase species distribution and diversity.

The long-term improvement in Crooked River related to over 11 miles of in channel and riparian improvements is expected to increase the carrying capacity for listed steelhead and bull trout, leading to an upward trend in fish/water quality. Streamside shade will improve over these same miles with riparian plantings.

Bull Trout

The U.S. Forest Service, Idaho Department of Fish and Game, and Bureau of Land Management have surveyed Bull trout fish populations, from the mouth to the headwaters in both American River and in Crooked River. Bull trout were observed during the surveys in both river systems. These fish use the mainstem of both rivers for rearing and migration. In American River, the East Fork is a known cold water source with bull trout present. Upper Crooked River is recognized as important spawning and rearing habitat. Bull trout have also been observed using Relief Creek and Silver Creek. The effects of this action are shown in the Analysis of Effects (tables 37-39). The short term "degrade" for sediment yield expected to occur from in channel improvements and restoration activities coupled with timber harvest and temporary road construction and reconstruction will be followed by a long term improvement of fish habitat. There will be a measurable improvement in pool volume and pool quality, acting and potential woody debris and overtime stream temperatures in Crooked River. The long-term benefits associated with the project especially in Crooked River and Relief Creek, will improve conditions for bull trout over time.

Primary Constituent Elements of Bull Trout Critical Habitat

The following elements were considered in designing the American and Crooked River Project. Mitigation is in place (PacFish) to assure no further impacts will occur to these important elements. Where possible improvements will be made such as increased riparian plantings and additional in channel improvements.

American River

1) ***Permanent water having low levels of contaminants such that normal reproduction, growth, and survival are not inhibited.***
   a) **Pathway**: Water Quality
   b) **Indicator**: Chemical contamination/nutrients
   c) **Analysis in support of Determination:** Project Design and Mitigation Measures Items 29, 30 and 31 are designed to meet these needs.

2) ***Water temperatures ranging from 2 to 15 degrees C (36 to 59 degrees F), with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range will vary depending on bull trout life history stage and form, geography, elevation, diurnal and seasonal variation, shade, such as that provided by riparian habitat, and local groundwater influence.***
   a) **Pathway**: Water Quality
   b) **Indicator**: Temperature
   c) **Analysis in support of Determination:** No timber will be harvested in PacFish streamside RHCAs. Project activities include riparian plantings to increase stream shade.
3) ***Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and instream structures.***
   a) **Pathway:** Habitat Elements
   b) **Indicators:** Large woody debris, pool frequency and quality, large pools, off channel habitat, refugia.
   c) **Analysis in support of Determination:** RHCS will be managed to protect and achieve the Riparian Management Objectives (RMOs).
   d) **Pathway:** Channel conditions and Dynamics
   e) **Indicators:** Wetted width/maximum depth ratio, streambank condition, floodplain connectivity
   f) **Analysis in support of Determination:** RHCS will be managed to protect and achieve the Riparian Management Objectives (RMOs).
4) ***Substrate of sufficient amount, size, and composition to ensure success of egg and embryo over winter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine substrate less than 0.63 cm (0.25 in) in diameter and minimal substrate embeddedness are characteristic of these conditions.***
   a) **Pathway:** Water Quality
   b) **Indicator:** Sediment
   c) **Analysis in support of Determination:** Restoration activities in American River associated with this action are designed to reduce non-point sediment sources and improve substrate conditions over time. Existing roads will be decommissioned.
   d) **Pathway:** Habitat Elements
   e) **Indicator:** Substrate embeddedness
   f) **Analysis in support of Determination:** Restoration activities in American River associated with this action are designed to reduce non-point sediment sources and improve substrate conditions over time. Existing roads will be decommissioned.
5) ***A natural hydrograph, including peak, high, low, and base flows within historic ranges or, if regulated, a hydrograph that demonstrates the ability to support bull trout populations.***
   a) **Pathway:** Flow/Hydrology
   b) **Indicator:** Change in peak/base flows

c) **Analysis in support of Determination:** See ECA/ Water yield discussion above. No significant increase in water yield is anticipated in American River or its tributaries. The increases in ECA associated with this project are not likely to disturb the existing hydrograph.

6) ***Springs, seeps, and groundwater sources, and subsurface water connectivity to contribute to water quality and quantity.***
   a) **Pathway:** Channel Condition and Dynamics
   b) **Indicator:** Floodplain connectivity
   c) **Analysis in support of Determination:** RHCS will be managed to protect and achieve the Riparian Management Objectives (RMOs). Streamside and wetland RHCAs will be protected as called for in The Nez Perce Forest plan including Amendment 20 (PacFish)
   d) **Pathway:** Flow/Hydrology
   e) **Indicator:** Change in peak/base flows
   f) **Analysis in support of Determination:** See ECA/ Water yield discussion above. No significant increase in water yield is anticipated in American River or its tributaries. The increases in ECA associated with this project are not likely to disturb the existing hydrograph.

7) ***Migratory corridors with minimal physical, biological, or chemical barriers between spawning, rearing, over wintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows.***
   a) **Pathway:** Habitat Access
   b) **Indicator:** Physical barriers
   c) **Analysis in support of Determination:** Undersized culverts and fish migration barriers will be replaced (3-9).
   d) **Pathway:** Water quality
   e) **Indicator:** Chemical contaminants/nutrients, temperature
   f) **Analysis in support of Determination:** Project design and Mitigation Measures #4 and 32 are designed to maintain existing water quality and improve water temperature.
   g) **Pathway:** Flow/Hydrology
   h) **Indicator:** Change in peak/base flows
   i) **Analysis is support of Determination:** See ECA/ Water yield discussion above. No significant increase in water yield is anticipated in American River or its tributaries. The increases in ECA associated with this project are not likely to disturb the existing hydrograph.

8) ***An abundant food base including terrestrial organisms of riparian origin, aquatic macro invertebrate, and forage fish.***
   a) **Pathway:** Water Quality, Habitat Elements, Channel Condition and Dynamics, Habitat Access
   b) **Indicators:** All 13 associated with these 4 pathways
   c) **Analysis in support of Determination:** See above

9) ***Few or no predatory, interbreeding, or competitive nonnative species present.***
   a) **Diagnostic:** Population structure
   b) **Indicator:** Persistence and genetic integrity
   c) **Analysis in support of Determination:** Little is known of persistence or genetic integrity. Brook trout are present throughout the system.
   d) **Pathway:** Habitat access
   e) **Indicator:** Physical barriers
   f) **Analysis in support of Determination:** Culverts being replaced will not increase brook trout distribution.

<u>CROOKED RIVER</u>

1) ***Permanent water having low levels of contaminants such that normal reproduction, growth and survival are not inhibited.***
   a) **Pathway**: Water Quality
   b) **Indicator**: Chemical contamination/nutrients
   c) **Analysis in support of Determination:** Project Design and Mitigation Measures Items 29, 30 and 31 are designed to meet these needs.
2) ***Water temperatures ranging from 2 to 15 degrees C (36 to 59 degrees F), with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range will vary depending on bull trout life history stage and form, geography, elevation, diurnal and seasonal variation, shade, such as that provided by riparian habitat, and local groundwater influence.***
   a) **Pathway**: Water Quality
   b) **Indicator**: Temperature
   c) **Analysis in support of Determination:** No timber will be harvested in PacFish streamside RHCAs. Project activities include riparian plantings to increase stream shade.
3) ***Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and instream structures.***
   a) **Pathway:** Habitat Elements
   b) **Indicators:** Large woody debris, pool frequency and quality, large pools, off channel habitat, refugia.
   c) **Analysis in support of Determination:** RHCS will be managed to protect and achieve the Riparian Management Objectives (RMOs). Instream structures will be added to 15-20 miles of mainstem Crooked River and 1.6 miles of Relief Creek, increasing LWD, pools and pool quality.
   d) **Pathway:** Channel conditions and Dynamics
   e) **Indicators:** Wetted width/maximum depth ratio, streambank condition, floodplain connectivity

f) **Analysis in support of Determination:** RHCS will be managed to protect and achieve the Riparian Management Objectives (RMOs).

4) ***Substrate of sufficient amount, size, and composition to ensure success of egg and embryo over winter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine substrate less than 0.63 cm (0.25 in) in diameter and minimal substrate embeddedness are characteristic of these conditions.***
   a) **Pathway:** Water Quality
   b) **Indicator:** Sediment
   c) **Analysis in support of Determination:** Restoration activities in Crooked River associated with this action are designed to reduce non-point sediment sources and improve substrate conditions over time. Existing roads will be decommissioned.
   d) **Pathway:** Habitat Elements
   e) **Indicator:** Substrate embeddedness
   f) **Analysis in support of Determination:** Restoration activities in Crooked River and Relief Creek associated with this action are designed to reduce non-point sediment sources and improve substrate conditions over time. Existing roads will be decommissioned.

5) ***A natural hydrograph, including peak, high, low, and base flows within historic ranges or, if regulated, a hydrograph that demonstrates the ability to support bull trout populations.***
   a) **Pathway:** Flow/Hydrology
   b) **Indicator:** Change in peak/base flows
   c) **Analysis in support of Determination:** See ECA/ Water yield discussion above. No significant increase in water yield is anticipated in Crooked River or its tributaries. The increases in ECA associated with this project are not likely to disturb the existing hydrograph.

6) ***Springs, seeps, and groundwater sources, and subsurface water connectivity to contribute to water quality and quantity.***
   a) **Pathway:** Channel Condition and Dynamics
   b) **Indicator:** Floodplain connectivity
   c) **Analysis in support of Determination:** RHCS will be managed to protect and achieve the Riparian Management Objectives (RMOs). Streamside and wetland RHCAs will be protected as called for in The Nez Perce Forest plan including Amendment 20 (PacFish)
   d) **Pathway:** Flow/Hydrology
   e) **Indicator:** Change in peak/base flows
   f) **Analysis in support of Determination:** See ECA/ Water yield discussion above. No significant increase in water yield is anticipated in Crooked River or its tributaries. The increases in ECA associated with this project are not likely to disturb the existing hydrograph.

7) ***Migratory corridors with minimal physical, biological, or chemical barriers between spawning, rearing, over wintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows.***

a) **Pathway:** Habitat Access
b) **Indicator:** Physical barriers
c) **Analysis in support of Determination:** Undersized culverts and fish migration barriers will be replaced (9-25).
d) **Pathway:** Water quality
e) **Indicator:** Chemical contaminants/nutrients, temperature
f) **Analysis in support of Determination:** Project design and Mitigation Measures #4 and 32 are designed to maintain existing water quality and improve water temperature.
g) **Pathway:** Flow/Hydrology
h) **Indicator:** Change in peak/base flows
i) **Analysis is support of Determination:** See ECA/ Water yield discussion above. No significant increase in water yield is anticipated in Crooked River or its tributaries. The increases in ECA associated with this project are not likely to disturb the existing hydrograph.

8) An abundant food base including terrestrial organisms of riparian origin, aquatic macro invertebrate, and forage fish.

a) **Pathway:** Water Quality, Habitat Elements, Channel Condition and Dynamics, Habitat Access
b) **Indicators:** All 13 associated with these 4 pathways
c) **Analysis in support of Determination:** See above

9) Few or no predatory, interbreeding, or competitive nonnative species present.

a) **Diagnostic:** Population structure
b) **Indicator:** Persistence and genetic integrity
c) **Analysis in support of Determination:** Little is known of persistence or genetic integrity. Brook trout are present throughout the system.
d) **Pathway:** Habitat access
e) **Indicator:** Physical barriers
f) **Analysis in support of Determination:** Culverts being replaced will not increase brook trout distribution.

STEELHEAD/REDBAND TROUT

Steelhead trout are found throughout both American River and Crooked River although densities are low. The existing condition of this habitat is degraded. The baseline as defined in the SFCR BA (1999) shows Moderate and Low Habitat Condition for Watershed Road Density, Streamside Road Density, Riparian Vegetation Condition, Stream bank Stability, Water Temperature, Cobble Embeddedness, Large Woody Debris, Pool Frequency, and Pool Quality. The riparian vegetation condition and stream bank stability ratings are a direct result of early mining in both mainstem and tributaries

The effects of this action are shown in the Analysis of Effects (Tables 37-39). The short term "degrade" for sediment yield is expected to occur from in channel improvements and restoration activities coupled with timber harvest and temporary road construction and reconstruction will be followed by a long term improvement of fish habitat. There will be a measurable improvement in pool volume and pool quality, acting and potential woody debris and possibly overtime stream temperatures in Crooked River. There may be other site specific improvements associated with the stream restoration and soil restoration work, but the ratings are for the overall American River and Crooked River watersheds and for the most part, we will maintain most elements as a result of this action.

The project as defined in the American and Crooked River FEIS and in this Biological Assessment/Evaluation contains risks to the existing conditions and possible impacts. The long-term objective for the project is to restore the watershed conditions to a more natural, functioning condition. The only way this can be achieved is with a short-term impact to that system and the fish it supports.

FALL CHINOOK SALMON

Fall chinook are likely using the lower South Fork Clearwater River. Nez Perce Tribal Fisheries personnel have observed a redd at this location. The small increase of sediment from this project would be insignificant when measured on site over 20 miles downstream. The long-term reduction will help improve fish habitat in the mainstem.

WESTSLOPE CUTTHROAT TROUT

Both American River and Crooked River support high concentrations of westslope in the headwater reaches. Fish in the mainstem and lower tributaries may experience a short-term reduction in winter and summer rearing habitats. The project results in long term improvement to this habitat. The overall westslope populations in the South Fork are well distributed.

SPRING CHINOOK SALMON

The non-listed spring/summer chinook use the mainstem rivers and tributaries for spawning and rearing. Excess fish from Dworshak Fish Hatchery and other neighboring hatcheries like Clear Creek are often used to supplement these fish. Individual fish may experience a short-term reduction in winter and summer rearing habitats. The project results in long term improvement to this habitat.

PACIFIC LAMPREY

The Pacific Lamprey is facing the same migratory hazards and habitat degradation as other anadromous fish species in Idaho. The number of spawning adults in the S.F. Clearwater River is suspected to have totaled fewer than 50 Pacific lamprey annually 1998-2001. Suitable habitat remains in the upper Red River, Newsome Creek, American River, and Crooked River, but Pacific lamprey ammocoetes and macrothalmia were not found (BPA, Project Number 2000-028-00). Individual lamprey may experience a short-term reduction in winter and summer rearing habitats. The project results in long term improvement to this habitat.

TABLE 37: ANALYSIS OF EFFECTS OF THE ACTION FOR STEELHEAD AND BULL TROUT AMERICAN RIVER

Pathways / Indicators	Environmental Baseline Condition[1]			Effects Of The Action(s)[2]		
	High	Mod.	Low	Improve	Maint.	Degrade
Watershed Conditions						
Watershed Road Density		X		X		
Streamside Road Density		X			X	
Landslideprone Road Density		X			X	
Riparian Veg Condition			X		X	
Peak/Base Flow		X			X	
Water Yield (ECA)	X				X	
Sediment Yield		X		X long term		X short term
Channel Conditions and Dynamics						
Width/Depth Ratio		X			X	
Streambank Stability		X			X	
Floodplain Connectivity			X		X	
Water Quality						
Temperature			X		X	
Suspended Sediment			X		X	
Chemical Contamination/Nutrients		X			X	
Habitat Access						
Physical Barriers - Adult			X		X	
Physical Barriers - Juvenile			X		X	
Habitat Elements						
Cobble Embeddedness			X		X	
Percent Surface Fines			X		X	
Percent Fines by Depth			X		X	
Large Woody Debris			X		X	
Pool Frequency			X		X	
Pool Quality		X			X	
Off-channel Habitat			X		X	
Habitat Refugia			X		X	
Take						
Harassment	X				X	
Redd Disturbance	X				X	
Juvenile Harvest		X			X	
Bull Trout Subpopulation						
Subpopulation Size			X		X	
Growth and Survival			X		X	
Life History Diversity and Isolation			X		X	
Persistence and Genetic Integrity			X		X	
Integr. of Spec. and Hab. Cond.			X		X	

1 Indicators of high, moderate, or low habitat condition

2 "Restore" means to change the function of an indicator for the better, or that the rate of restoration is increased. "Maintain" means to that the function of an indicator will not be degraded and that the natural rate of restoration for this indicator will not be retarded. "Degrade" means to change the function of an indicator for the worse, or that the natural rate of restoration for this indicator is retarded. In some cases, a "not properly functioning" indicator maybe further worsened, and this should be noted.

*- Short Term Degrade with Long Term Improvement

Table 38: Analysis Of Effects Of The Action For Steelhead and Bull Trout Crooked River

Pathways / Indicators	Environmental Baseline Condition[1]			Effects Of The Action(s)[2]		
	High	Mod.	Low	Improve	Maint.	Degrade
Watershed Conditions						
Watershed Road Density		X			X	
Streamside Road Density			X		X	
Landslideprone Road Density	X				X	
Riparian Veg Condition			X	X		
Peak/Base Flow		X			X	
Water Yield (ECA)	X				X	
Sediment Yield		X		X long term		X short term
Channel Conditions and Dynamics						
Width/Depth Ratio		X		X		
Streambank Stability		X		X		
Floodplain Connectivity			X	X		
Water Quality						
Temperature	X				X	
Suspended Sediment (No Data)					X	
Chemical Contamination/Nutrients	X				X	
Habitat Access						
Physical Barriers - Adult		X			X	
Physical Barriers - Juvenile		X			X	
Habitat Elements						
Cobble Embeddedness			X		X	
Percent Surface Fines		X			X	
Percent Fines by Depth			X		X	
Large Woody Debris			X	X		
Pool Frequency			X	X		
Pool Quality		X		X		
Off-channel Habitat			X			
Habitat Refugia		X				
Take						
Harassment		X			X	
Redd Disturbance	X				X	
Juvenile Harvest		X			X	
Bull Trout Subpopulation Characteristics & Habitat Integration					X	
Subpopulation Size					X	
Growth and Survival					X	
Life History Diversity and Isolation					X	
Persistence and Genetic Integrity					X	
Integr. of Spec. and Hab. Cond.					X	

1 Indicators of high, moderate, or low habitat condition

2 "Restore" means to change the function of an indicator for the better, or that the rate of restoration is increased. "Maintain" means to that the function of an indicator will not be degraded and that the natural rate of restoration for this indicator will not be retarded. "Degrade" means to change the function of an indicator for the worse, or that the natural rate of restoration for this indicator is retarded. In some cases, a "not properly functioning" indicator maybe further worsened, and this should be noted.

*- Short Term Degrade with Long Term Improvement

Table 39:Analysis Of Effects Of The Action For Steelhead and Bull Trout South Fork Clearwater River

Pathways / Indicators	Environmental Baseline Condition[1]			Effects Of The Action(s)[2]		
	High	Mod.	Low	Improve	Maint.	Degrade
Watershed Conditions						
Watershed Road Density			X		X	
Streamside Road Density			X		X	
Landslideprone Road Density		X			X	
Riparian Veg Condition		X			X	
Change in Peak/Base Flow			X		X	
Water Yield (ECA)			X		X	
Sediment Yield		X			X	
Channel Conditions and Dynamics						
Width/Depth Ratio	---	---	---		X	
Streambank Stability			X		X	
Floodplain Connectivity			X		X	
Water Quality						
Temp. (Steelhead) –Spawning			X		X	
Temp. (Steelhead) – Rear. and Migr.			X		X	
Temp. (Bull Trout)			X		X	
Suspended Sediment/Turbidity	X				X	
Chemical Contaminants/Nutrients		X			X	
Habitat Access						
Physical Barriers - Adult		X			X	
Physical Barriers - Juvenile		X			X	
Habitat Elements						
Cobble Embeddedness			X		X	
Percent Surface Fines		X			X	
Percent Fines by Depth			X		X	
Large Woody Debris	---	---	---		X	
Pool Frequency	---	---	---		X	
Pool Quality	---	---	---		X	
Off-channel Habitat			X		X	
Habitat Refugia		X			X	
Take						
Harassment			X		X	
Redd Disturbance	X				X	
Juvenile Harvest			X		X	

1 Indicators of high, moderate, or low habitat condition

2 "Restore" means to change the function of an indicator for the better, or that the rate of restoration is increased. "Maintain" means to that the function of an indicator will not be degraded and that the natural rate of restoration for this indicator will not be retarded. "Degrade" means to change the function of an indicator for the worse, or that the natural rate of restoration for this indicator is retarded. In some cases, a "not properly functioning" indicator maybe further worsened, and this should be noted.

*- Short Term Degrade with Long Term Improvement

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APPENDIX A – WATERSHED AND FISH HABITAT IMPROVEMENTS

Watershed and fish habitat improvement projects are part of each alternative. The projects are designed to achieve the upward trend and soil quality requirements of the Nez Perce National Forest Plan, to achieve recovery of important habitats to ESA-listed fish and/or to meet Clean Water Act requirements, including TMDLs. A summary of projects by alternative is found below:

TABLE A.1: SUMMARY OF PROJECTS BY ALTERNATIVE

Project Type	American River				Crooked River				Project Total			
	B	C	D	E	B	C	D	E	B	C	D	E
Road Decommissioning (miles)	4.9	7.5	8.4	19.5	9.0	9.8	10.5	17.5	13.9	17.3	18.9	37.0
(1000$)	46.1	71.9	80.9	152.9	66.4	73.8	70.3	117.2	112.5	145.7	151.2	270.1
Watershed Road Improvement (miles)	7.4	.7.4	7.4	7.4	8.6	9.2	9.2	17.2	16	16.6	16.6	24.6
(1000$)	13	13	13	13	33.5	43.0	52.3	100.0	46.6	56.0	65.3	113
Watershed Road Improvement (sites)	0	0	0	0	1	3	3	3	1	3	3	3
(1000$)	0	0	0	0	10.0	11.0	11.0	11.0	10	11.0	11.0	11.0
Stream Crossing Improvement (sites)	3	3	3	9	7	7	10	25	10	10	13	34
(1000$)	70.0	70.0	70.0	220.0	54.0	54.0	199	764.0	124.0	124.0	269.0	984.0
Instream Improvement (miles)	0	0	0	0	10.3	11.1	11.1	14.6	10.3	11.1	11.1	14.6
(1000$)	0	0	0	0	182.5	222.5	222.5	737.0	182.5	222.5	222.5	737.0
Recreation and Trail Improvement (miles)	1.6	1.6	1.6	2.4	0.7	0.7	0.7	2.2	2.3	2.3	2.3	4.6
(1000$)	8.3	8.3	8.3	12.3	7.0	7.0	7.0	14.5	15.3	15.3	15.3	26.8

Project Type	American River				Crooked River				Project Total			
	B	C	D	E	B	C	D	E	B	C	D	E
Recreation and Trail Improvement (acres)	0	0	0	0	.1	8.1	8.1	8.1	.1	8.1	8.1	8.1
(1000$)	0	0	0	0	2	52	52	52	2	52	52	52
Mine Site Reclamation (acres)	0	0	0	0	7	7	7	9	7	7	7	9
(1000$)	0	0	0	0	15	15	15	25	15	15	15	25
Soil Restoration (acres)	4.4	8.1	9.6	20.4	13	18	23	37	18	26	32	58
(1000$)	10.0	18.3	25.6	49.9	29.8	48.6	59.2	89.6	39.8	70.0	84.8	139.5
Grand Total Cost (1000$)	147	182	198	448	400	527	688	1910	547	711	886	2,358

Note: Alternative D units and costs are those associated with required projects only. When additional projects are factored in, the units and costs are the same as Alternative E.

In the context of watershed improvement projects, road decommissioning applies to existing roads and can include treatments ranging from abandonment to recontouring. The selection of treatment type is based on the condition of the road, proximity to resource values such as streams, cost, and other factors. The objectives of road decommissioning are to reduce negative resource impacts and reduce maintenance costs by removing roads that are not needed for access. Most of the roads planned for decommissioning within this project were identified through a roads analysis process. Some roads were added or deleted based on field reconnaissance. These were screened with Forest and District personnel to ensure that future access needs were being met. Temporary roads constructed and decommissioned as part of this project are not considered to be watershed improvements and are not listed in this appendix.

Several roads were identified as having improvement needs due to adverse effects on aquatic resources. The proposed work would improve drainage and reduce erosion from these roads. Techniques could include adding drainage structures, shaping the road, adding rock surfacing in places, hardening fords, and revegetation. In general, roads being reconstructed primarily for timber haul purposes are not listed as watershed improvements. There are some exceptions, however, which are identified by an underscored "Y" or "N" in the alternative columns of the following tables. These exceptions consist of roads that require reconstruction or reconditioning for timber haul purposes, and the treatment activities are deemed to be a benefit to watershed health.

Stream crossing improvements are done to improve upstream passage of aquatic organisms, particularly spawning salmonids, and/or to reduce risk of culvert failure during runoff events. In some cases, culverts can be upgraded by retrofitting with baffles or other means. In other situations, they may be replaced with larger culverts or other stream crossing devices.

Instream improvements include a variety of treatments. Large woody debris (LWD) placement is done to improve aquatic habitat and restore natural function of stream systems. LWD is placed in stream reaches where there is deficiency in this habitat feature. Riparian planting is done to improve streamside shade, restore bank stability, and improve aquatic ecological function. It is done using adapted native species and can include sedges, forbs, shrubs, or trees. Maintenance generally involves improvements to existing fish habitat structures in the channel and can include floodplain enhancement adjacent to existing improvements. Channel reconstruction includes the above and often re-establishing stream meanders.

Soil restoration treats areas that have negative impacts to soil productivity or stability. Objectives of soil restoration include improvement of soil productivity and reduction of adverse effects to hydrologic function. Treatments can include soil de-compaction, recontouring of excavated skid trails and landings, replacing surface soil and organic material, stabilization of erosion features such as rills and gullies, and revegetation. The soil restoration units identified with this project are primarily associated with roads planned for decommissioning, but some legacy temporary roads are also proposed for recontouring. An estimated 1 to 6 percent of the gross stand area associated with many of the roads proposed for decommissioning would receive actual treatment.

AMERICAN RIVER

Table Notes: Alternative Codes: Y = Yes (considered in alternative), N = No (not considered in alternative); Underscore in alternative column indicates road is used as haul route, with roadwork possibly funded by a timber sale or stewardship contract.

MIDDLE AMERICAN RIVER (17060305-05-06)

TABLE A.2: EXISTING ROADS TO BE DECOMMISSIONED

Road Number	Decommissioning Level	Description/Comments	Alternative				Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
443C	Moderate reconstruction and recontour	Haul route; eroding cuts and bare travelway with poor drainage; sediment depositing into American River	Y	Y	Y	Y	0.8	$1,740 $10,000	$1,400 $8,000	M	M
9835	Recontour	0.5 miles within project boundary 1.0 miles in upper American.	N	N	N	Y	0.9	$10,000	$9,000	L	L
78480	Recontour	Ridgetop road	N	N	N	Y	0.2	$5,000	$1,000	L	L
78481	Recontour	Ridgetop road	N	N	N	Y	0.2	$5,000	$1,000	L	L
78482	Recontour	Ridgetop road. 0.12 miles in Flint Creek.	N	N	N	Y	0.18	$5,000	$900	L	L
78483	Recontour	Ridgetop road	N	N	N	Y	0.2	$5,000	$1,000	L	L

TABLE A.3: INSTREAM IMPROVEMENT PROJECTS

Project Name	Stream Name	Description/Comments	Alternative				Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
Telephone Creek – site id 100	Telephone Creek	Channel reconnect. BLM project	N	N	N	N	NA	NA	NA	M	H

TABLE A.4: RECREATION AND TRAIL IMPROVEMENT PROJECTS

Project Name	Location	Description/Comments	Alternative				Units (ac/mi)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
Trail #510 – site id 22	American River	Trail improvement, erosion, and crossing improvements. Decrease surface erosion and reduce sediment and impacts at stream crossing. ATV use occurring on trail closed to motorized use, except for snowmobiles. Restrict access with a physical barrier.	N	N	N	Y	0.8 mi	$5,000	$4,000	L	L
Telephone Creek ATV	Telephone Creek – from mouth upstream	Road-to-trail conversion. BLM project – trail extends onto FS land. Coordinate with rec/trails	N	N	N	N	NA	NA	NA		

TABLE A.5: SOIL RESTORATION PROJECTS

Stand Number	Adjacent Road Number	Description/Comments	Alternative				Units (acres)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
81107085	443	Recontour unclassified road and associated skid trails	N	Y	Y	Y	1.0	2260	2500	M	H
81206009	443C	Recontour skid trail and landing	Y	Y	Y	Y	.3	2260	700		M
81206009	443C	Recontour skid trail	Y	Y	Y	Y	.5	2260	1100		M
81107088	78480	Recontour skid trail	N	N	N	Y	.2	2260	500		L
81206007	78481	Recontour 2 landings	N	N	N	Y	.4	2260	900		L
81206049	78483	Recontour skid trail	N	N	N	Y	.3	2260	700		L
81207018	78550	Recontour 2 skid trails	N	N	N	Y	.6	2260	1400		M
81207005	9812F	Recontour skid trail	N	N	N	Y	.1	2260	300		M
81107010	9835	Recontour skid trail	N	N	N	Y	.2	2260	500		L

UPPER AMERICAN RIVER (17060305-05-09)

TABLE A.6: EXISTING ROADS TO BE DECOMMISSIONED

Road Number	Decommissioning Level	Description/Comments	Alternative				Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
9835	Recontour	0.5 miles within project boundary; 0.9 miles in middle American.	N	N	N	Y	1.0	$10,000	$10,000		

EAST FORK AMERICAN RIVER (17060305-05-10)

TABLE A.7: EXISTING ROADS TO BE DECOMMISSIONED

Road Number	Decommissioning Level	Description/Comments	Alternative				Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
9812E	Recontour	Ridgetop road	*N*	*N*	*N*	*Y*	1.0	*$5,000*	$5,000	L	L
9812E1	Recontour	Ridgetop road					0.1	*$5,000*	$500	L	L
78526	Recontour	This road is trashed with saturated template. In old harvest unit; cut and fill failures exist. Accesses private land and will require coordination with landowner.	*N*	*N*	*N*	*Y*	0.15	*$10,000*	$1,500	M	M

TABLE A.8: STREAM CROSSING IMPROVEMENTS

Road Number	Crossing Number	Stream	Description/Comments	Alternative				Units (sites)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
				B	C	D	E					
1810	811	East Fork American	48” culvert with 20’ fill; recommend upgrade by adding baffles for aquatic organism passage	N	N	N	Y	1	$15,000	$15,000	L	L
Private	1005	East Fork American	72” culvert with 6” fill, partial fish barrier, BLM project, connected action	N	N	N	N	1				

TABLE A.9: SOIL RESTORATION PROJECTS

Stand Number	Adjacent Road Number	Description/Comments	Alternative				Units (acres)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
81205076	9812E	Recontour 2 landings	N	N	N	Y	.4	2260	1000		L

KIRKS FORK (17060305-05-11)

TABLE A.10: EXISTING ROADS TO BE DECOMMISSIONED

Road Number	Decommissioning Level	Description/Comments	Alternative				Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
1810C	Moderate reconstruction and recontour	Gullied road with little or no drainage; restore riparian function; first 0.69 miles to be reconstructed and maintained, last 0.23 miles to be decommissioned	Y	Y	Y	Y	0.23	$10,000	$2,300	H	M
1810E	Recontour		Y	Y	Y	Y	0.33	$10,000	$3,300	M	M
9832A	Maintenance and Recontour	Haul route; road vegetated and drivable, but not needed for future. Decommission from stream crossing.	Y	Y	Y	Y	1.42	$1,740	$2,500	H	H
							0.21	$10,000	$2,100		
77328	Recontour	Need to coordinate access needs with BLM, though it may not be used for Eastside Township project. Last one out recontours the road.					0.33	$10,00	$3,300	H	H

Table A.11: Watershed Road Improvements

Road Number	Improvement Level	Description/Comments	Alternative				Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
9832	Maintenance	Improve drainage on first 0.1 miles (in lower American River); repair or remove 2 failing culverts near end of road (in Kirks Fork); Haul route. Alt E treats only 1st 0.7 miles. Road is also proposed for haul under Red Pines EIS	Y	Y	Y	Y	4.0	$250	$1,000	M	M

Table A.12: Stream Crossing Improvements

Road Number	Crossing Number	Stream	Description/Comments	Alternative				Units (sites)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
				B	C	D	E					
1810B	873	Unnamed trib to Kirks Fork	30” culvert with 10’ fill; recommend larger pipe for hydraulics	N	N	N	Y	1	$10,000	$10,000	L	L

Table A.13: Recreation and Trail Improvement Projects

Project Name	Location	Description/Comments	Alternative				Units (ac/mi)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
Trail #846 – site id 23	Kirks Fork	ATV trail should be evaluated for possible improvement needs. Coordinate with BLM.	Y	Y	Y	Y	1.16 miles	5000	$5,800	L	M

TABLE A.14: SOIL RESTORATION PROJECTS

Stand Number	Adjacent Road Number	Description/Comments	Alternative B	Alternative C	Alternative D	Alternative E	Units (acres)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
81602063	1810	Recontour skid trail	N	N	N	Y	.3	2260	700		M
81602066	1810	Recontour skid trail	N	N	N	Y	.5	2260	1100		M
81605021	77326	Recontour landing	N	N	N	Y	.2	2260	500		M
81605019	77328	Recontour 2 landings	Y	Y	Y	Y	.4	2260	1000		H
81605005	9832A	Recontour skid trail	Y	Y	Y	Y	.5	2260	1100		H

WHITAKER CREEK (17060305-05-12)

TABLE A.15: EXISTING ROADS TO BE DECOMMISSIONED

Road Number	Decommissioning Level	Description/Comments	Alternative B	Alternative C	Alternative D	Alternative E	Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
78485	Recontour						0.52	$5,000	$2,600	*M*	*H*
78525	Varied	Road borders old plantation, several skid trail throughout	N	Y	Y	Y	0.12	$5,000	$600	L	M

TABLE A.16: WATERSHED ROAD IMPROVEMENTS

Road Number	Improvement Level	Description/Comments	Alternative B	Alternative C	Alternative D	Alternative E	Units	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
1809B	Moderate reconstruction	Ditched, but some ponding; 2 low risk culverts should be removed; failed log culvert; 0.62 miles to be used for haul	Y	Y	Y	Y	0.62 mi	$1,000	$620	L	L
1809B	Minor reconstruction	Non-haul route – see comments above.	Y	Y	Y	Y	1.28 miles	$2,000	$2,560	L	L
1809C	Major Reconstruction	Ongoing erosion due to failing drainage. Planned for use under BLM Eastside township project. Coordinate w/ BLM	Y	Y	Y	Y	0.78	$10,000	$7,800	M	H

TABLE A.17: STREAM CROSSING IMPROVEMENTS

Road Number	Crossing Number	Stream	Description/Comments	Alternative				Units (Sites)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
				B	C	D	E					
1809	890	Unnamed trib to Whitaker Creek	24" culvert with 20' fill; replace with larger pipe for hydraulics and possible fish passage	N	N	N	Y	1	$20,000	$20,000	L	L
1809C	884	Whitaker Creek	Replace failing log culvert; to be used by BLM	Y	Y	Y	Y	2	$10,000	$20,000	M	H

TABLE A.18: INSTREAM IMPROVEMENT PROJECTS

Project Name	Stream Name	Description/Comments	Alternative				Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
Whitaker Creek – site id 101	Whitaker Creek	Channel reconnect, wetland restoration. BLM project	N	N	N	N	NA	NA	NA	M	H

TABLE A.19: SOIL RESTORATION PROJECTS

Stand Number	Adjacent Road Number	Description/Comments	Alternative				Units (acres)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
81307014	1809B1	Recontour unclassified road, trail, and landing	N	Y	Y	Y	1.2	2260	2260	M	H
81307002	78485	Recontour skid trail	Y	Y	Y	Y	.3	2260	700		H
81303002	78525	Recontour skid trail	Y	Y	N	Y	.1	2260	300		H

QUEEN CREEK (17060305-05-13)

TABLE A.20: EXISTING ROADS TO BE DECOMMISSIONED

Road Number	Decommissioning Level	Description/Comments	Alternative				Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
1809A	Moderate reconstruction and recontour	Haul route alts C & D.	N	Y	Y	Y	0.92	$3,800 $10,000	$3,500 $9,200	M	H
1810D	Recontour	Gullied road with little or no drainage; restore riparian function	N	Y	Y	Y	0.8	$10,000	$8,000	M	H
78486	Recontour		N	Y	Y	Y	0.5	$10,000	$5,000	M	H
78487	Recontour		N	N	Y	Y	0.1	$10,000	$1,000	L	M
78488	Recontour		N	N	Y	Y	0.2	$10,000	$2,000	L	M
78489	Recontour	Ridgetop road	N	N	N	Y	0.4	$5,000	$2,000	L	L
78489A	Recontour	Ridgetop road	N	N	N	Y	0.2	$5,000	$1,000	L	L
78489B	Recontour	Ridgetop road	N	N	N	Y	0.15	$5,000	$750	L	L

TABLE A.21: STREAM CROSSING IMPROVEMENTS

Road Number	Crossing Number	Stream	Description/Comments	Alternative				Units (sites)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
				B	C	D	E					
1809	977	Queen Creek	36" culvert with 25' fill; seepy site; possible replacement for hydraulics and fish passage; haul route	N	N	N	Y	1	$50,000	$50,000	L	M
1809	1090	Unnamed trib to Queen Creek	36" culvert with 20' fill; possible replacement for hydraulics and fish passage; haul route	N	N	N	Y	1	$50,000	$50,000	L	M

TABLE A.22: INSTREAM IMPROVEMENT PROJECTS

Project Name	Stream Name	Description/Comments	Alternative				Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
Queen Creek – site id 102	Queen Creek	Channel reconnect, wetland restoration. BLM project	N	N	N	N	NA	NA	NA	M	H

TABLE A.23: SOIL RESTORATION PROJECTS

Stand Number	Adjacent Road Number	Description/Comments	Alternative				Units (acres)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
81307013	1809A	Recontour skid trails	N	N	Y	Y	.6	2260	1500		H
81307014	1809B1	Recontour skid trail	N	N	N	Y	.4	2260	900		M
81308003	1810	Recontour skid trail	N	N	N	Y	.5	2260	1100		M
81308037	1810A	Recontour road to rock pit	N	N	Y	Y	.5	2260	1100		M
81308003	1810D	Recontour skid trail	N	Y	Y	Y	.2	2260	500		H
81308003	1810D	Recontour skid trail	N	Y	Y	Y	.3	2260	700		H
81308003	1810D	Recontour skid trail	N	Y	Y	Y	.8	2260	1800		H
81308007	78489	Recontour skid trail	N	N	N	Y	.2	2260	500		L
81308002	78489A	Recontour skid trail	N	N	N	Y	.2	2260	500		H

FLINT CREEK (17060305-05-14)

TABLE A.24: EXISTING ROADS TO BE DECOMMISSIONED

Road Number	Decommissioning Level	Description/Comments	Alternative B	Alternative C	Alternative D	Alternative E	Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
443F	Recontour	Ridgetop road	N	N	N	Y	0.9	$5,000	$4,500	L	L
1125B	Recontour	Ridgetop road	N	N	N	Y	0.2	$5,000	$1,000	L	L
1125B1	Recontour	Ridgetop road	N	N	N	Y	0.1	$5,000	$500	L	L
9807A	Recontour	Ridgetop road. Includes soil restoration	N	N	N	Y	0.4	$5,000	$2,000	L	L
9807A1	Recontour	Ridgetop road	N	N	N	Y	0.4	$5,000	$2,000	L	L
9807B	Maintenance and Recontour	Most of road is to be maintained, but recommend decommissioning end of road in existing clearcut (~0.6 mi). Road is 2.2 miles long	N	Y	Y	Y	0.6	$10,000	$6,000	M	H
9807B1	Recontour	Ridgetop road	N	N	N	Y	0.04	$5,000	$200	L	L
9812A	Moderate Reconstruction and Recontour	Haul route, followed by decommissioning; first 0.25 mi used for haul in alts B & E; entire road used for haul alt C & D; the 1st 0.72 miles rd. in fairly good condition; at Saddle Rd becomes more vegetated, eroding cut & fill slopes pose threat to mass wasting into trib of American River.	Y	Y	Y	Y	0.95	$1,130	$1,100	M	H
								$10,000	$9,500		
9812B	Recontour	Ridgetop road	N	N	N	Y	1.0	$5,000	$5,000	L	L
9812C	Recontour	Ridgetop road	N	N	N	Y	0.41	$5,000	$2,050	L	L
9812D	Recontour	Has plugged culverts	N	N	N	Y	1.25	$10,000	$12,500	L	M
9812F	Moderate Reconstruction and Recontour	Haul route; ridgetop road holding water; soils are compacted, and productivity low; decompact to increase soil productivity, reduce mass wasting. Used for BLM Eastside Township project	Y	Y	Y	Y	0.7	$2,950	$2,100	L	M
								$10,000	$7,000		
9812F1	Major Reconst. and Recontour	Same as 9812F. Used for BLM Eastside township project.	Y	Y	Y	Y	0.2	$3,480	$700	L	M
								$10,000	$2,000		
9812G	Recontour	Ridgetop road	N	N	N	Y	0.3	$5,000	$1,500	L	L
9812H	Recontour	Ridgetop road	N	N	N	Y	0.6	$5,000	$3,000	L	L
9834B	Recontour	Ridgetop road	N	N	N	Y	0.2	$5,000	$1,000	L	L
78482	Recontour	Ridgetop road. 0.18 miles in Middle American	N	N	N	Y	0.12	$5,000	$600	L	L
78586	Major reconst and recontour	Ridgetop road.	N	N	N	Y	0.5	$2,270	$1,100	L	L
								$5,000	$2,500		
78587	Reconstruct and Recontour	Road not used in alt C.	Y	N	Y	Y	0.6	$3,480	$2,100	L	L
								$10,000	$6,000		

Table A.25: Stream Crossing Improvements

Road Number	Crossing Number	Stream	Description/Comments	Alternative B	C	D	E	Units (sites)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
9812	766	Unnamed trib to Flint Creek	~30" culvert with 50% scour line; recommend replacement for hydraulics and accommodating fish passage; haul route	Y	Y	Y	Y	1	$50,000	$50,000	M	H

Table A.26: Soil restoration projects

Stand Number	Adjacent Road Number	Description/Comments	Alternative B	C	D	E	Units (acres)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
81202027	1125	Recontour landing	N	N	N	Y	.2	2260	500		H
81202027	1125B	Recontour landing	N	N	N	Y	.2	2260	500		H
81202027	1125B1	Recontour landing	N	N	N	Y	.2	2260	500		H
81206001	78482	Recontour skid trail	N	N	N	Y	.6	2260	1300		M
81202003	9807	Recontour skid trail	Y	Y	Y	Y	.4	2260	900		M
81202008	9807A	Recontour landing	Y	Y	Y	Y	.2	2260	500	L	L
81202031	9807B	Recontour landing	N	Y	Y	Y	.2	2260	500		H
81205028	9812	Recontour skid trail	Y	Y	Y	Y	.6	2260	1400		H
81205030	9812A	Recontour skid trail	Y	Y	Y	Y	.1	2260	300		H
81205083	9812A	Recontour skid trail	Y	Y	Y	Y	.3	2260	700		H
81205027	9812B	Recontour road extension	N	N	N	Y	.8	2260	1700		H
81205026	9812C	Recontour 2 skid trails	N	N	N	Y	.6	2260	1400		H
81205024	9812D	Recontour 3 skid trails	N	N	N	Y	.9	2260	2200		H
81205031	9812D	Recontour 2 skid trails	N	N	N	Y	.6	2260	1400		H
81207004	9812F1	Recontour skid trail	Y	Y	Y	Y	.3	2260	700		H
81203001	9812H	Recontour skid trail	N	N	N	Y	.3	2260	700		H
81203008	9812H	Recontour landing	N	N	N	Y	.2	2260	500		H

Stand Number	Adjacent Road Number	Description/Comments	Alternative				Units (acres)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
81204001	9834	Recontour skid trail	N	N	N	Y	.4	2260	900		M
81204009	9834	Recontour landing	N	N	N	Y	.2	2260	500		M

BOX SING CREEK (17060305-05-15)

TABLE A.27: EXISTING ROADS TO BE DECOMMISSIONED

Road Number	Decommissioning Level	Description/Comments	Alternative				Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
78516	Recontour	Mid-slope road	N	Y	Y	Y	0.20	$10,000	$2,000	L	M
78517	Recontour	Mid-slope road	N	Y	Y	Y	0.10	$10,000	$1,000	L	M

TABLE A.28: WATERSHED ROAD IMPROVEMENTS

Road Number	Improvement Level	Description/Comments	Alternative				Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
1810C	Moderate reconstruction	Haul route; 1' deep ruts in road. Decommission 0.23 mi in Kirks Fork.	Y	Y	Y	Y	0.69	$1,500	$1,035	M	H

TABLE A.29: STREAM CROSSING IMPROVEMENTS

Road Number	Crossing Number	Stream	Description/Comments	Alternative				Units (sites)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
				B	C	D	E					
1810	1028	Box Sing	24" pipe w/ 10' fill; 50% scour line; replace for hydraulics	N	N	N	Y	1	$5,000	$5,000	L	L

TABLE A.30: RECREATION AND TRAIL IMPROVEMENT PROJECTS

Project Name	Location	Description/Comments	Alternative				Units (ac/mi)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
Trail 830 and 807 crossings – site id 20	Junction with road trail 807 and Trail 810 crossings on Box Sing Creek	Crossing on Box Sing Creek in poor condition; decrease sediment into Box Sing Creek. Trail up Box Sing Creek needs recreation use management prescription.	Y	Y	Y	Y	0.5 mi	$5,000	$2,500	M	H

TABLE A.31: SOIL RESTORATION PROJECTS

Stand Number	Adjacent Road Number	Description/Comments	Alternative				Units (acres)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
81308001	1810	Recontour skid trail	N	N	N	Y	.3	2260	700		L
81308020	1810A	Restore rock pit	N	N	Y	Y	.5	10000	5000		M
81308031 81308002	78489	Recontour 3 skid trails	N	N	N	Y	.7	2260	1700		M

LOWER AMERICAN RIVER (17060305-05-16)

TABLE A.32: SOIL RESTORATION PROJECTS

Stand Number	Adjacent Road Number	Description/Comments	Alternative				Units (acres)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
81708025	9832A	Recontour skid trail	Y	Y	Y	Y	.2	2260	500		L
81708044	9832A	Restore landing	Y	Y	Y	Y	.2	2260	500		L

CROOKED RIVER

LOWER CROOKED RIVER (17060305-03-01)

TABLE A.33: EXISTING ROADS TO BE DECOMMISSIONED

Road Number	Decommissioning Level	Description/Comments	Alternative				Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
522F1	Recontour	Includes soil restoration	N	N	N	Y	0.40	$5,000	$2,000	L	L
9816F	Recontour	Ridgetop road. Starts in Red River	N	N	N	Y	0.61	$5,000	$3,050	L	L
9847	Reconstruct & Recontour	Wet draws pose threat to mass wasting into Crooked River. Haul route.	Y	Y	Y	Y	1.30	$1,000 $10,000	$1,300 $13,000	M	H
78404	Recontour	Ridgetop road. 1st 0.26 mi outside proj area	N	N	N	Y	0.7	$5,000	$3,500	L	L
78405	Recontour	Ridgetop road.	N	N	N	Y	0.2	$5,000	$1,000	L	L
78406	Recontour	Ridgetop road. Most of road outside proj area.	N	N	N	Y	0.1	$5,000	$500	L	L
78407	Recontour	Ridgetop road.	N	N	N	Y	0.1	$5,000	$500	L	L
78532	Recontour		N	N	N	Y	0.5	$10,000	$5,000	L	L
78533	Recontour	Outside analysis area boundary – used by BLM in Whiskey South; coord decom by BLM.	N	N	N	Y	0.2	$10,000	$4,000	L	L

TABLE A.34: WATERSHED ROAD IMPROVEMENTS

Road Number	Improvement Level	Description/Comments	Alternative				Units	Unit Cost	Cost	Priority 5^{th} Code	Priority 6^{th} Code
			B	C	D	E					
233	Minor Reconstruction	County road – the "narrows". Spot treatment. See also Crooked River "narrows" in-stream improvement projects. MP 2.56 to 6.06	N	N	N	Y	3.5 miles	$15,000	$52,500	M	M
1110	Minor Reconstruction	Aggregate surfacing and ditch rock, cutslope revegetation. Haul route. 2-3 locations over length of rd – approx 0.3 mi total. From mp 4.83 to mp 5.13	Y	Y	Y	Y	0.3 miles	$15,000	$4,500	M	M
9831	Maintenance	Drainage improvement, cutslope stabilization. MP 1.07 to 1.13.	Y	Y	Y	Y	0.06 miles	$80,000	$4,800	M	M

TABLE A.35: STREAM CROSSING IMPROVEMENTS

Road Number	Crossing Number	Stream	Description/Comments	Alternative				Units (sites)	Unit Cost	Cost	Priority 5^{th} Code	Priority 6^{th} Code
				B	C	D	E					
233	1665	Unnamed trib to Crooked R	County road. Replace culvert for hydraulics; low fill height; Approx MP 2.3.	N	N	N	Y	1	$20,000	$20,000	M	M
233	1548	Unnamed trib to Crooked R	County road. Replace culvert for hydraulics.	N	N	N	Y	1	$20,000	$20,000	M	M
9805	1935	Sec 14 trib to Crooked R	48" culvert; 10' fill height. Add baffles for fish passage (possible replacement)	N	N	N	Y	1	$15,000	$15,000	L	L
9805	1959	Sec 14 trib to Crooked R	48" culvert; 10' fill height. Add baffles for fish passage (possible replacement)	N	N	N	Y	1	$15,000	$15,000	L	L
9805	1967	Sec 14 trib to Crooked R	48" culvert; 10' fill height. Add baffles for fish passage (possible replacement)	N	N	N	Y	1	$15,000	$15,000	L	L
9831	1702	Unnamed trib to Crooked River	30" culvert; 10' fill height. Replacement for hydraulics, remove debris below outlet	N	N	N	Y	1	$20,000	$20,000	L	L

TABLE A.36: INSTREAM IMPROVEMENT PROJECTS

Project Name	Stream Name	Description/Comments	Alternative				Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
Lower Crooked River forced meanders – site id 1	Crooked River	Riparian planting and maintenance of existing improvements.	Y	Y	Y		3.2	$10,000	$32,000	H	H
						Y	3.2	$20,000	$64,000		
Lower Crooked River narrows – site id 2	Crooked River	Riparian planting & bioengineering to improve habitat and road-stream interactions; reestablish sinuosity in select areas – see also Crooked River “narrows” under watershed road improvements.	N	N	N	Y	3.5	$50,000	$175,000	M	M
Lower Crooked River narrows to Relief Creek – site id 3	Crooked River	Riparian planting and maintenance of existing improvements.	Y	Y	Y		1.7	$25,000	$42,500	H	H
						Y	1.7	$50,000	$85,000		

TABLE A.37: SOIL RESTORATION PROJECTS

Stand Number	Adjacent Road Number	Description/Comments	Alternative				Units (acres)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
82201170	1110	Recontour trail and landing	N	N	N	Y	.4	2260	900		M
82201022	1110B	Recontour landing	N	N	N	Y	.2	2260	500		L
82201022	1110B	Recontour skid trail	N	N	N	Y	.3	2260	700		L
82201093	1110B	Recontour road extension	N	N	N	Y	.5	2260	1100		L
82201133	1110F	Recontour skid trail	N	N	N	Y	.4	2260	900		M
82201130	1110H	Recontour skid trail	N	N	N	Y	.2	2260	500		M
82101064	522F1	Recontour landing	N	N	N	Y	.2	2260	500		L
82201011	77329A	Recontour skid trail	N	N	N	Y	.2	2260	500		M
82001040	78533	Recontour temp road and skid trail	N	N	N	Y	.8	2260	1800		M
82203083	9804	Recontour skid trail	N	N	Y	Y	.2	2260	300		M
82203084	9804	Recontour skid trail	N	N	Y	Y	.6	2260	1400		M
82203085	9804	Recontour 2 skid trails	N	N	Y	Y	.3	2260	700		M
82203087	9804	Recontour 2 landings	N	N	Y	Y	1.2	2260	2700		M

Stand Number	Adjacent Road Number	Description/Comments	Alternative				Units (acres)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
82203057	9804	Recontour skid trail/old mine road	N	Y	Y	Y	.9	2260	2100		H
82203080	9805	Recontour skid trail	N	N	N	Y	.5	2260	1100		H
82203003	9805A	Recontour landing	N	N	N	Y	.2	2260	500		H
82101061	9816	Recontour skid trails	N	N	Y	Y	1.0	2260	2260		M
82001134	9816F	Recontour skid trail	N	N	N	Y	.7	2260	1600		H
82001131	9831	Recontour skid trail	N	N	N	Y	.2	2260	500		L
82001117	9831	Recontour skid trails and landing	N	N	N	Y	.4	2260	900		L
82001042	9831	Recontour landing	N	N	N	Y	.2	2260	500		L
82201135	9844	Recontour 2 skid trails	N	N	N	Y	.4	2260	900		L
82202049	9844	Recontour skid trail	N	N	N	Y	.2	2260	500		L
82101027	9847	Recontour landing	N	N	N	Y	.2	2260	500		M
82101007	9847	Recontour skid trail	N	Y	Y	Y	.1	2260	300		H
82202098	9850	Recontour skid trail	N	N	N	Y	.1	2260	300		L
82101057	9870A	Recontour skid trail	N	N	N	Y	.2	2260	500		L

RELIEF CREEK (17060305-03-03)

TABLE A.38: ROADS TO BE DECOMMISSIONED

Road Number	Decommissioning Level	Description/Comments	Alternative				Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
522 B1	Reconstruct/ recontour	This road will be reconstructed for haul in Alt C and D. Planned for decommissioning, but might be used to replace portion of 522B.	Y	Y	Y	Y	1.10	$1,150 $10,000	$1,300 $11,000	M	H
522J	Recontour	Road is ponded and located in riparian zone on Relief Creek. Road is 0.2 mi long; first 0.1 mi to be maintained, remainder recontoured .	Y	Y	Y	Y	.10	$10,000	$1,000	M	H
78496A	Recontour	Ridgetop road. NEPA coverage in Red River Salvage. Road starts in Red River, including, additional	Y	Y	Y	Y	0.2	$5,000	$1,000	L	L

Road Number	Decommissioning Level	Description/Comments	Alternative				Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
		INFRA mileage									
78496B	Recontour	Same as 78496A	Y	Y	Y	Y	0.3	$5,000	$1,500	L	L
78496B1	Recontour	Same as 78496A	Y	Y	Y	Y	0.2	$10,000	$2,000	M	H
78496C	Recontour	Same as 78496A	Y	Y	Y	Y	0.3	$5,000	$1,500	L	L
78497	Varied	Ridgetop road. Road is compacted, but in generally good condition with effective water bars. Decompaction would increase soil productivity	N	N	N	Y	1.1	$5,000	$5,500	L	L
78497A	Recontour	Ridgetop road. Same as 78496A	N	N	N	Y	0.2	$5,000	$1,000	L	L
78497B	Recontour	Ridgetop road.	N	N	N	Y	0.4	$5,000	$2,000	L	L
78497B1	Recontour	Ridgetop road.	N	N	N	Y	0.2	$5,000	$1,000	L	L
78498	Recontour		N	N	N	Y	.40	$10,000	$4,000	L	M
78499	Abandon	Reclaimed by landscape, trees and shrubs could be planted	Y	Y	Y	Y	.70	$1,000	$700	L	M
78499A	Abandon	Same as 78499	Y	Y	Y	Y	.5	$1,000	$500	L	M
78499A1	Abandon	Same as 78499	Y	Y	Y	Y	.20	$1,000	$200	L	M
78500	Recontour		Y	Y	Y	Y	.30	$10,000	$3,000	M	H
78511	Recontour	Ridgetop road.	N	N	N	Y	0.1	$5,000	$500	L	L
78512	Recontour	Ridgetop road.	N	N	N	Y	0.2	$5,000	$1,000	L	L
78513	Recontour	Streamside encroachment	*Y*	*Y*	*Y*	*Y*	.50	*$10,000*	*$5,000*	*M*	*H*
78514	Recontour	0.8 miles in Middle Crooked	N	N	Y	Y	0.2	$5,000	$1,000	L	L
78539	Varied	Major reconstruction for haul route, followed by decommissioning	*Y*	*Y*	*Y*	*Y*	.20	*$4,280* *$10,000*	*$900* *$2,000*	*M*	*H*
78540	Partial recontour		*Y*	*Y*	*Y*	*Y*	.26	*$10,000*	*$2,600*	*M*	***H***

TABLE A.39: WATERSHED ROAD IMPROVEMENTS

Road Number	Improvement Level	Description/Comments	Alternative B	Alternative C	Alternative D	Alternative E	Units	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
522	Maintenance	Add ~10 cross-drains, ~0.5 mi ditch rock and possibly revegetate cutslopes pending further analysis. From mp 4.87 to mp 5.5.	N	Y	Y	Y	0.63 mi	$15,000	$9,450	M	H
522B	Moderate reconstruction	Road has poor drainage and is heavily rutted; drain and grade and close during wet season or obliterate to reduce sediment; also covered under Red River Salvage EA. 0.56 miles of 522B are located in Deadwood Creek - 1.70 miles in Relief Creek. MP 2.07 to 2.2 used for haul in Alts B, C, and E.	Y	Y		Y	2.2 mi	$4,400	$9,680	M	M
	Major reconstruction	MP 1.32 to 2.2 is major reconstruction for haul in Alt D.			Y		0.88	$15,000	$13,200		
	Moderate reconstruction						1.32	$4,400	$5.800		
9837	Maintenance	Road needs immediate maintenance attention; planned for haul route. Active cut sloughing on upper slope road. Watershed improvement recommended on 0.57 miles (mp 1.23 to mp 1.8), road is 3.2 miles long.	Y	Y	Y	Y	0.57 mi	$1,500	$900	M	H
9839	Maintenance	Decrease mass wasting into Relief Creek. Active cut slumping onto road with seepage at approx MP 0.2 and 0.3 (from mp 0.2 to mp 0.7). Road is 1.2 mi long.	Y	Y	Y	Y	0.5 mi	$2,000	$1,000	M	M

Road Number	Improvement Level	Description/Comments	Alternative B	Alternative C	Alternative D	Alternative E	Units	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
9859	Moderate reconstruction	Road used for private land access; remove log culverts on steep side slopes; sediment delivery to Relief Creek; Road is 1.05 mi long; see also crossing no 1964 stream crossing improvements. Further coord w/ temp rd access between draft & final.	Y	Y	Y	Y	0.45 mi	$3,000	$1,350	M	H
9876 – site id 1	Temporary stabilization (i.e. road storage	Site at mp 1.43. Pull back fill at stream crossing to restore hydrologic function. See also crossing nos. 1907 & 1926.	N	Y	Y	Y	1 sites	$500	$500	M	H
9876 – site id 2	Temporary stabilization (i.e. road storage	Site at mp 2.16. Pull back fill at stream crossing to restore hydrologic function. See also crossing nos. 1907 & 1926.	N	Y	Y	Y	1 sites	$500	$500	M	H

TABLE A.40: STREAM CROSSING IMPROVEMENTS

Road Number	Crossing Number	Stream	Description/Comments	Alternative B	Alternative C	Alternative D	Alternative E	Units (sites)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
1803	1969	East Fork Relief Creek	Replace 48" culvert for fish passage	N	N	N	Y	1	$100,000	$100,000	M	H
1803	2024	Unnamed trib to Relief Creek	24" culvert with 30' fill depth; replacement for hydraulic capacity; check for aquatic organism passage.	N	N	N	Y	1	$20,000	$20,000	L	M
1803	2055	Unnamed trib to Relief Creek	30" culvert with 30' fill depth; replacement for hydraulic capacity and fish passage; scour line 50%+; good habitat above.	N	N	N	Y	1	$60,000	$60,000	M	M

Road Number	Crossing Number	Stream	Description/Comments	Alternative B	Alternative C	Alternative D	Alternative E	Units (sites)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
1803	2212	Unnamed trib to Relief Creek	24" culvert; 30' fill; limited habitat above; steep A channel. Replacement for hydraulic capacity; check for aquatic organism passage.	N	N	N	Y	1	$30,000	$30,000	L	L
1803	2234	Unnamed trib to Relief Creek	24" culvert with 20' fill; replace with larger pipe for hydraulic capacity; pipe needs maintenance.	N	N	Y	Y	1	$20,000	$20,000	M	M
1803	2241	Relief Creek	Replace 48" culvert for fish passage	N	N	Y	Y	1	$120,000	$120,000	H	H
9837	2213	Unnamed trib to Relief Creek	18" culvert with 10' fill; no fish & little water above; probable replacement with larger pipe for hydraulic capacity; road needs maintenance	N	N	N	Y	1	$5,000	$5,000	L	L
9859	1964	E Fk Relief Cr	Remove failing log bridge and consider replacing with hardened ford for private land access; potential cost share; see also watershed road improvements.	Y	Y	Y	Y	1	$10,000	$10,000	H	H
9876	1907	Unnamed trib to Relief Creek	Crossing removed, but encroaching fill remains; restore stream channel, floodplain, and wetland. Spot treatments on road before crossing location – see watershed road improvement treatments above.	Y	Y	Y	Y	1	$2,000	$2,000	L	M
9876	1926	Unnamed trib to Relief Creek	Same as #1907	Y	Y	Y	Y	1	$2,000	$2,000	L	M

TABLE A.41: INSTREAM IMPROVEMENT PROJECTS

Project Name	Stream Name	Description/Comments	Alternative				Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
Relief Creek Instream Improvement – site id 4	Relief and East Fork Relief Creeks	Streamside planting in old harvest units and mined areas; Large woody debris placement; existing structure maintenance.	Y	Y	Y	N	1.6	$7,500	$12,000	M	H
			N	N	N	Y	1.1				
Relief Creek Instream Improvement – site id 5	Relief and East Fork Relief Creeks	Streamside planting in old harvest units and mined areas; Large woody debris placement; existing structure maintenance. Adds channel sinuosity restoration & flood plain restoration to 0.5 mile of site id 4.	N	N	N	Y	0.5	$150,000	$75,000	M	M

TABLE A.42: SOIL RESTORATION

Stand Number	Adjacent Road Number	Description/Comments	Alternative				Units (acres)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
82104025	1803	Recontour landing	N	N	N	Y	.3	2260	700		L
82102024	1803	Recontour trail	N	N	N	Y	.2	2260	500		L
82103004	1803	Recontour trails and landing	N	N	Y	Y	1.3	2260	2900		M
82104069	1803	Partial stabilization of rock pit	N	Y	Y	Y	1.0	10,000	10,000		M
82104094	1803	Recontour skid trail	N	N	N	Y	.2	2260	500		L
82102032	522B	Recontour skid trail	Y	Y	Y	Y	.6	2260	1400		H
82102001	522B	Recontour skid trail	N	N	N	Y	.1	2260	300		M
82102001	522B	Recontour skid trail	N	N	N	Y	.4	2260	900		M
82102038	522B1	Recontour skid trail	Y	Y	Y	Y	.3	2260	700		H
82102001	522B1	Recontour skid trail	Y	Y	Y	Y	.3	2260	700		H
82102001	522B1	Recontour skid trail	Y	Y	Y	Y	.2	2260	500		H
82102004	78497	Recontour landing	Y	Y	Y	Y	.2	2260	500		H
82102005	78497B	Recontour skid trail	Y	Y	Y	Y	.2	2260	500		H
82102003	78500	Recontour skid trail	Y	Y	Y	Y	.4	2260	900		H
82102001	78511	Recontour landing	Y	Y	Y	Y	.2	2260	500		H
82105034	78539	RECONTOUR SKID TRAILS	Y	Y	Y	Y	.4	2260	1000		H
82104001	9836A	Recontour landing	Y	Y	Y	Y	.5	2260	1100		M
82104001	9836A	Recontour skid trail	Y	Y	Y	Y	.1	2260	300		M
82105008	9837	Recontour skid trail	Y	Y	Y	Y	.5	2260	1100		M

Stand Number	Adjacent Road Number	Description/Comments	Alternative				Units (acres)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
82105011	9837	Recontour skid trail	Y	Y	Y	Y	.2	2260	500		H
82105037	9837	Recontour skid trail	Y	Y	Y	Y	.5	2260	1100		H
82104013	9837	Recontour 2 skid trails	Y	Y	Y	Y	.6	2260	1500		H
82104047	9855A	Landing and skid trail decompaction	Y	Y	Y	Y	.6	2260	1300		M
82104090	9855A	Landing and skid trail decompaction	Y	Y	Y	Y	.6	2260	1300		M
82103002	9856A	Recontour skid trail	Y	Y	Y	Y	.3	2260	600		M
82103001	9857	Recontour skid trail	Y	Y	Y	Y	.4	2260	900		M
82103001	9857	Recontour skid trail	Y	Y	Y	Y	.1	2260	300		M
82103001	9857	Recontour temp road and landing	Y	Y	Y	Y	.7	2260	1600		H
82102003	9876	Recontour skid trail	Y	Y	Y	Y	.3	2260	700		M
82102023	9876	Recontour skid trail	Y	Y	Y	Y	.4	2260	900		M

MIDDLE CROOKED RIVER (17060305-03-04)

TABLE A.43: ROADS TO BE DECOMMISSIONED

Road Number	Decommissioning Level	Description/Comments	Alternative				Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
9833	Recontour	Decommission last 1.4 miles; total road length 3.3 miles.	Y	Y	N	Y	1.6	$10,000	$16,000	H	H
9836	Road to trail conversion	Road to trail conversion from Crooked River to ~4700' elev. Maintain rd width for snowmobile groomer. Trail to remain open for motorized trail vehicles.	Y	Y	Y	Y	1.46	$5,000	$7,350	H	H
9836B	Recontour	DECOMMISSION FROM CROSSING 2285 TO END OF ROAD	N	Y	Y	Y	0.24	$10,000	$2,400	M	H
9836B1	Recontour	Road parallels small intermittent stream	N	Y	Y	Y	0.1	$10,000	$1,000	M	H
9836C	Varied	C road parallels B road entrance camo'd w/slash pile. Decrease potential mass wasting into Silver Cr.	N	Y	Y	Y	0.4	$10,000	$4,000	M	H
78514	Recontour	0.2 miles in Relief Creek	N	N	Y	Y	0.8	$5,000	$4,000	L	L
78534	Recontour		N	N	Y	Y	0.6	$5,000	$3,000	L	L
78538	Recontour		N	N	Y	Y	0.5	$5,000	$2,500	L	L

TABLE A.44: WATERSHED ROAD IMPROVEMENTS

Road Number	Improvement Level	Description/Comments	Alternative B	Alternative C	Alternative D	Alternative E	Units	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
233A – site id 3	Minor reconstruction	Road involves private land and mining access. Site at mp 0.18. See also improvements at two stream crossings. High flows (Quartz Creek) run out of bar and down rd to private residences.	Y	Y	Y	Y	1 site	$10,000	$10,000	M	H
9836	Moderate reconstruction	This road is in bad shape and leads to Crooked River. Varying (w/ alt) lengths will be reconstructed for timber haul. Watershed improvement needs 1st 3.4 miles. See also rd-trail conversion under rd decom.	Y	Y	Y	Y	3.4 mi	$3,000	$10,200	H	H
9838A	Minor reconstruction	Spurs off main road are heavily used by ATV's creating large gullies and are high concern for sediment transportation. Decrease sediment transportation. Haul route.	Y	Y	Y	Y	1.11 mi	$1,000	$1,110	L	M
9848	Minor reconstruction	Improve drainage with cross drains and spot gravel; improve stream crossings; recommend decommissioning sediment trap (mp 3.17); stabilize slump (mp 3.2) above sediment trap; cost share with minerals program	N	N	N	Y	3.4 mi	$1,000	$3,400	L	M
9848B	Maintenance	Improve drainage with cross drains; possible rd-trail conversion (has current ATV use); coord w/ recreation	N	N	N	Y	1.1 mi	$1,000	$1,100	L	M

TABLE A.45: STREAM CROSSING IMPROVEMENTS

Road Number	Crossing Number	Stream	Description/Comments	Alternative				Units (sites)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
				B	C	D	E					
233	2092	Baker Gulch	36” culvert; shallow fill; replacement for hydraulics and fish passage; county road (discretionary).	N	N	N	Y	1	$70,000	$70,000	H	H
233	2136	Rainbow Gulch	24” culvert; shallow fill; replacement for hydraulics and fish passage; county road (discretionary).	N	N	N	Y	1	$50,000	$50,000	H	H
233A	2340	Quartz Creek	Old bridge laying in channel; remove bridge; harden and improve existing ford; near private land; see also watershed rd improvements.	Y	Y	Y	Y	1	$10,000	$10,000	H	H
233A	2341	Quartz Creek	Same as 2340	Y	Y	Y	Y	1	$10,000	$10,000	H	H
9836	2205	Sawmill Creek	18” culvert; shallow fill; replacement for hydraulics; on haul route	N	N	Y	Y	1	$5,000	$5,000	L	M
9836	2243	Unnamed trib to Crooked River	18” culvert; 10’ fill depth; replacement for hydraulics; on haul route	N	N	N	Y	1	$5,000	$5,000	L	L
9836B	2285	Unnamed trib to Silver Creek	18” culvert; 20’ fill depth; inlet ripped, culvert partially mashed; replacement for hydraulics; recommend decommissioning from crossing to end of road	Y	Y	Y	Y	1	$5,000	$5,000	M	M
9838	2335	Unnamed trib to Silver Creek	48” culvert; recommend replacement with pipe arch; evaluate for fish passage (cost includes passage provisions)	N	N	N	Y	1	$120,000	$120,000	L	L
9848	2371	Unnamed trib to Crooked River	Designed as temporary sediment trap; decommission sediment trap and replace pipe for hydraulics.	Y	Y	Y	Y	1	$15,000	$15,000	M	H

TABLE A.46: INSTREAM IMPROVEMENT PROJECTS

Project Name	Stream Name	Description/Comments	Alternative				Units (miles)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
Middle Crooked River Habitat Improvement Maintenance – site id 6	Crooked River (Relief Creek to Fivemile)	Riparian planting and maintenance of existing improvements. Includes stabilization of fillslope on private land and Baker Gulch side channel maintenance.	Y	Y	Y		2.8	$25,000	$70,000	H	H
						Y	2.8	$50,000	$140,000		
Crooked River near Silver Creek – site id 7	Crooked River (Fivemile to Orogrande)	New fish habitat improvements on 0.8 miles of stream. Work includes adding stream meanders, floodplain creation, large woody debris placement, and riparian planting.	N	Y	Y		0.8	$50,000	$40,000	M	H
						Y	0.8	$200,000	$160,000		
Baker Gulch – site id 8	Baker Gulch Creek	Reconnect channel mouth to Crooked River to restore stream connectivity.	Y	Y	Y	Y	0.02	NA	$10,000	H	H
Rainbow Gulch – site id 9	Rainbow Gulch Creek	Reconnect channel mouth to Crooked River to restore stream connectivity.	Y	Y	Y	Y	0.02	NA	$10,000	H	H
Quartz Creek Riparian Planting – site id 10	Quartz Creek	Plant RHCA along harvest unit.	Y	Y	Y	Y	1.0	$6,000	$6,000	L	H

TABLE A.47: RECREATION AND TRAIL IMPROVEMENT PROJECTS

Project Name	Location	Description/Comments	Alternative				Units (ac/mi)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
Trail 807 – site id 12	Near Fivemile Campground	Trail is very steep and rutting, was rebuilt, but still dangerous for the user. Surface erosion to ephemeral channel during rainstorm and snowmelt events. Decrease surface erosion and rutting on steep section, decrease sediment routing to ephemeral channel. User-created trail also associated with this trail.	N	N	N	Y	1.5 mi	$5,000	$7,500	M	M
Crooked River Camp-grounds – site id 10	Upstream of Orogrande above Road #233	Crooked River Campgrounds above Orogrande and ATV raceway" 15' wide x 100' long. Manage sites to restrict motorized use to designated areas, improve soil productivity, reduce erosion and sediment delivery into Crooked River.	N	Y	Y	Y	5 ac	$5,000	$25,000	M	M
Crooked River Camp-grounds – site id 10	Upstream of Orogrande above Road #233	Crooked River Campgrounds above Orogrande and ATV raceway" 15' wide x 100' long. Manage sites to restrict motorized use to designated areas, improve soil productivity, reduce erosion and sediment delivery into Crooked River.	N	Y	Y	Y	5 ac	$5,000	$25,000	M	M
Old Orogrande Hotel – site id 9	At Old Orogrande near confluence of West and East Forks of Crooked River	Control parking on meadow adjacent to Road #233 and across from historic hotel, decompact and seed area, designate parking with boulders. Decrease soil compaction, erosion, sediment delivery, and invasion of weeds. Construct sanitation facilities.	N	Y	Y	Y	2 ac	$10,000	$20,000	M	M
Unauthorized Bridge on Quartz Creek	Upper Quartz Creek NE NW Sec 18. End of FS Road # 9848B	User-built bridge to cross the headwaters of Quartz Creek. Use associated with recreation within the Diamond Hitch Mine Prospects and accesses road system closed to motorized use, except for snowmobiles. Remove bridge and restore site.	Y	Y	Y	Y	0.1 ac	NA	$2,000	L	M

Project Name	Location	Description/Comments	Alternative				Units (ac/mi)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
Unauthorized ATV trail connects FS Road # 9848B with FS Road # 9838 – site id 3	Trail Originates from the end of the 9848B Road and travels upslope to the end of the 9838 road.	Trail is deeply rutted in places. Active erosion from trail into Quartz Creek. Trail accesses road system closed to motorized use, except for snowmobiles. Rehabilitate trail and manage access.	Y	Y	Y	Y	0.2 mi	$10,000	$2,000	L	H
Private ATV Access to the Quartz Creek ATV Loop – site id 21	Private road access north out of Orogrande.	The public is using a road accessing private land to reach FS Rd # 9838A, which is closed to motorized access, except for snowmobiles. Manage road as access to private land and restrict unauthorized use of Rd #9838A.	Y	Y	Y	Y	0.5 mi	$10,000	$5,000	M	H

TABLE A.48: MINE SITE RESTORATION

Project Name	Location	Description/Comments	Alternative				Units (acres)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
Pond and mine site near Petsite. site id 8	Head of tributary in Quartz Creek the NWSW Sec 7	Old pond at the head of the trib, accessed by old road, pond overflow eroding, wetland damage, old mine site. Drain and recontour pond, recontour road into mine site. Restore wetland, clean up mine site. Decrease sediment overflowing out of pond into wetland. Decrease erosion from road into trib, restore wetland	N	N	N	Y	2	$5,000	$10,000	L	M
Diamond Hitch – site id 1	End of Road #9848B in Quartz Creek	Test adit seepage and mine tailings for metals.	Y	Y	Y	Y	5	$1,000	$5,000	L	M
Unnamed Mine #1 – site id 7	On Quartz Creek 0.2 miles upstream from mouth near end of Road #233A	Restore and stabilize tailings in and adjacent to Quartz Creek. Test adit seepage and mine tailings for metals.	Y	Y	Y	Y	1	$5,000	$5,000	L	M
Unnamed Mine #2 – site id 6	On Quartz Creek 0.17 miles upstream from mouth along Road #233A.	Restore and stabilize placer mining site.	Y	Y	Y	Y	1	$5,000	$5,000	L	M

TABLE A.49: SOIL RESTORATION PROJECTS

Stand Number	Adjacent Road Number	Description/Comments	Alternative				Units (acres)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
83102023	1803	RECONTOUR 2 SKID TRAILS AND LANDING	N	N	N	Y	.4	2260	1000		L
83102019	1803	Recontour skid trail	N	N	N	Y	.1	2260	500		L
83102026	1803	Recontour skid trail system and fireline	N	N	N	Y	.4	2260	1000		L
83102066	1803	Recontour skid trail	N	N	N	Y	.2	2260	500		M
83102069	1803	Recontour skid trail	N	N	N	Y	.3	2260	700		M
83102028	1803	Recontour skid trail	N	N	N	Y	.5	2260	1100		M
83102029	1803	Recontour 2 skid trails	N	N	N	Y	.6	2260	1400		M
83102008	1803	Recontour 2 skid trails	N	N	N	Y	.4	2260	900		M
83102038	77325	Recontour 2 skid trails	N	N	N	Y	.5	2260	1100		M
83101005	78514	Recontour skid trail	N	N	Y	Y	.2	2260	500		H
83101005	78514	Recontour landing	N	N	Y	Y	.2	2260	500		H
83102002	78534	Recontour landing	N	N	Y	Y	.2	2260	500		H
83102002	78534	Recontour skid trail	N	N	Y	Y	.1	2260	300		H
83101050	78538	Recontour skid trail	N	N	Y	Y	.1	2260	500		M
83101061	9833	Recontour trail	Y	Y	N	Y	.5	2260	1100		H
83101061	9833	Recontour landing	Y	Y	N	Y	.2	2260	500		H
83101053	9833	Recontour temp road	Y	Y	Y	Y	.6	2260	1400		H
83101046	9836	Recontour skid trail	Y	Y	Y	Y	.6	2260	1300	H	H
83101042	9836	Recontour skid trail	Y	Y	Y	Y	.7	2260	1600	H	H
83101041	9836	Recontour skid trail	Y	Y	Y	Y	.4	2260	1000	H	H
83101004	9836	Recontour 2 skid trails	Y	Y	Y	Y	.2	2260	1000	H	H
83101002	9836	Recontour skid trail	Y	Y	Y	Y	.2	2260	500	H	H
83102001	9836B	Recontour 2 skid trails	N	Y	Y	Y	.8	2260	1800	M	H
83102017	9836B1	Recontour landing	N	Y	Y	Y	.2	2260	500	M	H
83102001	9836C	Recontour skid trail	N	Y	Y	Y	.5	2260	1100	M	M

Stand Number	Adjacent Road Number	Description/Comments	Alternative				Units (acres)	Unit Cost	Cost	Priority 5th Code	Priority 6th Code
			B	C	D	E					
83102082	9838A	Recontour legacy temporary road	Y	Y	Y	Y	1.2	2260	3100	M	H
83102064	9838	Recontour unclassified road and landing	N	Y	Y	Y	1.0	2260	2260	L	H
83103010	9838	Recontour unclassified road	N	Y	Y	Y	.4	2260	1000	M	H
83103007	9838	Recontour unclassified road	N	N	N	Y	.8	2260	1300	M	H
83102058	9838	Recontour skid trail	N	N	N	Y	.2	2260	500	L	L
83103018	9838	Recontour skid trails	N	N	N	Y	.2	2260	700	L	L
83103028	9838	Recontour 2 skid trails	N	N	N	Y	.4	2260	1400	L	L

Appendix B – Information Supporting the Watershed and Fisheries Analysis

FISH/WATER QUALITY OBJECTIVES

Appendix A of the Nez Perce National Forest Plan lists fish/water quality objectives by prescription watershed for streams in the analysis area. Fish/water quality objectives displayed below provide management direction in terms of maximum sediment yield over baseline conditions that can be approached of equaled for a specified number of years per decade, ranging from one to three times. Watersheds with fish/water objectives of 90 percent are allowed one entry per decade, those with 80 percent are allowed two entries per decade and those with 70 percent are allowed three entries per decade. All objectives are relative to full habitat potential of 100 percent.

FISHERY/WATER QUALITY OBJECTIVES IN APPENDIX A OF THE NEZ PERCE NATIONAL FOREST PLAN

TABLE B.1: AMERICAN RIVER

Prescription Watershed	Prescription Watershed Name	Beneficial Use	Current Fishery Habitat Condition (%)	Fishery Water Quality Objective (% habitat potential)	Sediment Yield Guideline (% over baseline)	Entry Frequency Guideline (per decade)
17060305-05-06	Middle American River[1]	A	50 %	90 %	30 %[2]	1
17060305-05-09	Upper American River[1]	A	60 %	90 %	30 %	1
17060305-05-10	East Fork American River[1]	A	60%	90%	30%[2]	1
17060305-05-11	Kirks Fork[1]	A	50 %	90 %	30 %	1
17060305-05-12	Whitaker Creek	R	70 %	70 %	60 %	3
17060305-05-13	Queen Creek	R	70 %	70 %	60 %	3
17060305-05-14	Flint Creek[1]	A	40 %	90 %	30 %	1
17060305-05-15	Box Sing Creek	R	70 %	70 %	60 %	3
17060305-05-16	Lower American River[3]	A	50 %	90%	30 %[2]	1

[1] These streams are suffering from both a lack of diversity (similar to category 1) and excess sediment from past roading and timber management activities. Along with increasing diversity through direct habitat improvement, state-of-the-art techniques will be used to remove sediment from the gravel environment. Improvements will be scheduled between 1986 and 1995. Timber management can occur in these watersheds, concurrent with habitat improvement efforts, as long as a positive, upward trend in habitat carrying capacity is indicated.

[2] These prescription watersheds, unlike most, are not true watersheds. By definition, a true watershed includes all the lands draining through a stream reach. These footnoted watersheds drain only part of such a hydraulic unit and generally contain the downstream reaches of relatively large streams. For sediment yield analysis on these downstream reaches, all upstream prescription watersheds are combined into a true watershed. Sediment yield guidelines (Column 6) apply only to true watersheds. Entry frequency guidelines (Column 7) apply to prescription watersheds regardless of whether they are true watersheds.

[3] Lower American River was not included in Appendix A of the Forest Plan. Objectives and guidelines are those recommended for use in the American/Crooked Project.

TABLE B-2: CROOKED RIVER

Prescription Watershed	Prescription Watershed Name	Beneficial Use	Current Fishery Habitat Condition (%)	Fishery Water Quality Objective (% habitat potential)	Sediment Yield Guideline (% over baseline)	Entry Frequency Guideline (per decade)
17060305-03-01	Lower Crooked River[1]	A	50 %	90 %	30 %[2]	1
17060305-03-03	Relief Creek[1]	A	60%	90 %	30 %	1
17060305-03-04	Middle Crooked River	A	90 %	90 %	30 %[2]	1

In Forest Plan Appendix A, there were three general beneficial use designations, anadromous fisheries (A), resident fisheries (R) and municipal watershed (MW). Only the first two are present in project area watersheds.

The watershed numbering and nomenclature system has evolved over the past twenty years. At the time of the Forest Plan (1987), the Hydrologic Unit Code (HUC) system was nationally coordinated to the 4th code HUC (e.g. South Fork Clearwater River subbasin = 17060305). Efforts are currently underway to nationally coordinate HUCs to the 6th code level. This analysis relies on the older codes.

At the time of the Forest Plan, 6th code watersheds were referred to as prescription watersheds. Current nomenclature refers to those as subwatersheds. Also, 5th code watersheds were referred to as NFS (National Forest System) watersheds. Current nomenclature refers to those as simply watersheds.

Prescription watersheds such as Lower American River and Lower Crooked River pose a unique situation in that they are not a single complete drainage (see footnote above). At the time of the Forest Plan, these were called face drainages. Current terminology refers to them as composite watersheds. Those watersheds called true watersheds at the time of the Forest Plan are now referred to as pure watersheds. The maps below show how composite and pure watersheds are related in the project area.

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[1] Streams listed in the category are below carrying capacity due primarily to a lack of diversity (pool structure). This problem is caused by the removal of all large boulders and woody debris from the stream through placer mining. These habitat components will be replaced through direct habitat improvement projects. Work will be scheduled in the latter part of the first decade (1989-1995). Work in Crooked River is underway, with an expected completion date of 1989. Timber management activities can occur in these drainages, concurrent with habitat improvement efforts, as long as a positive, upward trend in habitat carrying capacity is indicated.

[2] These prescription watersheds, unlike most, are not true watersheds. By definition, a true watershed includes all the lands draining through a stream reach. These footnoted watersheds drain only part of such a hydraulic unit and generally contain the downstream reaches of relatively large streams. For sediment yield analysis on these downstream reaches, all upstream prescription watersheds are combined into a true watershed. Sediment yield guidelines (Column 6) apply only to true watersheds. Entry frequency guidelines (Column 7) apply to prescription watersheds regardless of whether they are true watersheds.

Figure B.1: Composite v Pure Watersheds - American River

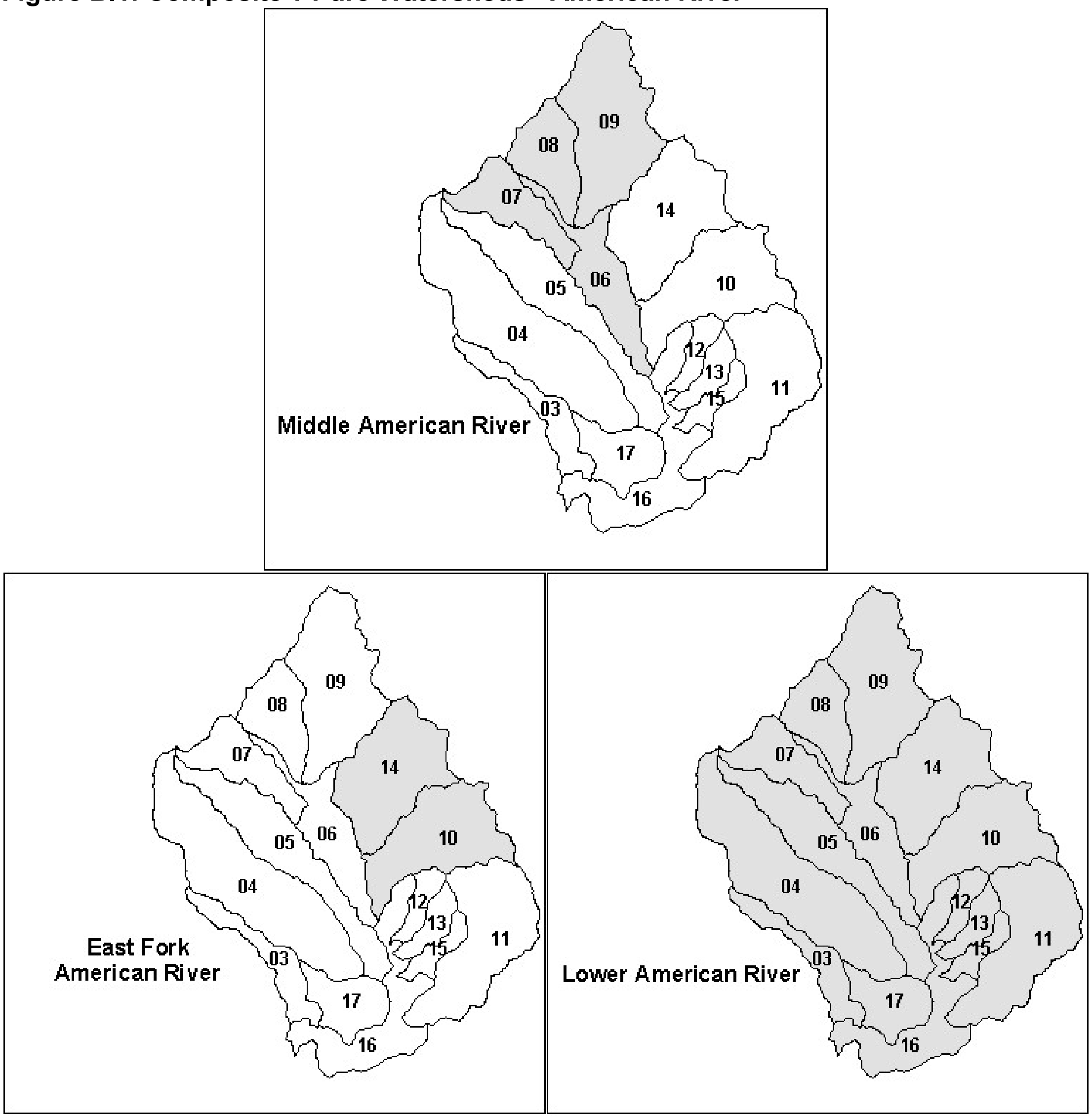
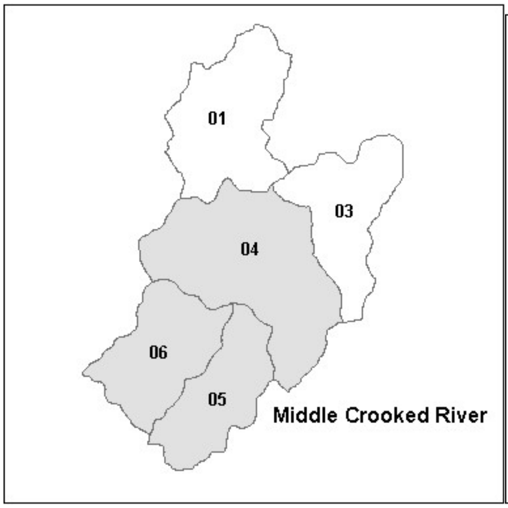
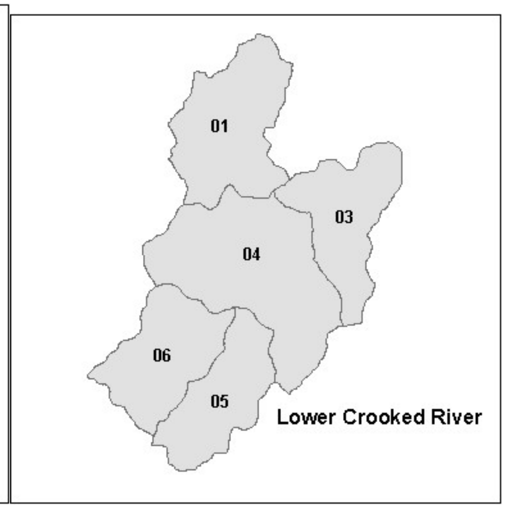


FIGURE B.2: COMPOSITE V PURE WATERSHEDS – CROOKED RIVER





For purposes of water yield (ECA) and sediment yield (NEZSED) analysis, composite watersheds are compiled into larger pure watersheds. This is done in order to maintain integrity with the assumptions used to develop the ECA and NEZSED procedures. Both of these models assume the water yield and sediment yield reflect the conditions in the entire pure watershed above the analysis point (also known as pour point).

Each of the maps above shows the relationship between composite and pure watersheds for the American and Crooked River watersheds. Using Lower Crooked River as an example, when ECA or NEZSED results are reported, they include all of the shaded subwatersheds. For more detail on the watershed boundaries and associated stream systems, see Maps 7a and 7b.

UPWARD TREND

The Nez Perce Forest Plan provides direction that timber harvest in sediment-limited watersheds that do not meet their Fish/Water Quality objectives, as listed in Appendix A, would occur only where concurrent watershed improvement efforts result in a positive upward trend in habitat condition. Many of the area streams do not meet their objectives and are in this category. Those are the watersheds with footnotes 1/ and 2/in Tables B.1 and B.2.

THE DFC TABLES

To estimate natural fish habitat potential and quantify existing stream conditions as required by the Forest Plan, the Nez Perce National Forest is using a Desired Future Condition (DFC) Model developed on the Clearwater National Forest (Espinosa 1992). This model addresses specific conditions and channel types found on the Nez Perce Forest using a habitat quality index. Values for the habitat parameters are quantified in a set of desired future condition (DFC) tables. The DFC tables list the specific fish habitat parameter and a value or range that a stream should have in order to be at a given percentage of the streams potential and to meet the Forest Plan Objectives for that watershed. The DFC values, habitat parameter data and their relationships are stratified by channel types and fish species. The values for the fish habitat parameters listed in the DFC tables are considered achievable for streams under natural conditions in the absence of major disturbances or are reflective of what good fish habitat should be. Most of the habitat parameters are consistent for each species, and they very slightly by channel type. Past work has shown a need to adjust some of the elements to better-fit natural conditions and what is achievable. The DFC for acting and potential woody debris in a meadow channel is often used as an example of this.

Forest Plan Riparian Area Direction

In addition, the Nez Perce Forest Plan defines standards for vegetation management in riparian areas (Management Area 10), which are collectively defined as lakes, lakeside lands, perennial streams, seasonally flowing streams supporting riparian vegetation, and adjoining lands that are dominated by riparian vegetation (NPFP III-30-33). This area includes the floodplains of streams and the wetlands associated with springs, lakes, and ponds. Guidelines include the following:

- Consider cumulative impacts of proposed actions on the entire riparian ecosystem
- Manage riparian areas to maintain and enhance their value for wildlife, fishery, aquatic habitat, and water quality.
- Maintain sufficient streamside vegetative canopy to ensure acceptable water temperatures for fish and to provide cover.
- Management activities shall not be permitted to adversely change the composition and productivity of key riparian vegetation. Riparian areas now degraded by management should be rehabilitated before any further nondependent resource use.
- Planned ignitions, when within prescription, would be allowed to burn to enhance resource values.

Forest Plan Amendment 20 (PACFISH)

The PACFISH Environmental Assessment amended the Nez Perce Forest Plan in 1995 and is incorporated as Amendment 20. PACFISH establishes riparian goals, riparian management objectives (RMOs), and defines riparian habitat conservation areas (RHCAs). It includes specific direction for land management activities within riparian areas adjacent to streams, lakes, wetlands, and landslide-prone terrain. Riparian goals establish an expectation of the characteristics of healthy, functioning watersheds, riparian areas, and fish habitat. The goals direct the Forest to maintain or improve habitat elements such as water quality, stream channel integrity, instream flows, riparian vegetation, and several others.

Riparian management objectives (RMOs) for stream channel condition provide the criteria against which attainment, or progress toward attainment, of the riparian goals is measured. They include habitat attributes such as number of pools, amount of large wood in the channel, stability of the stream banks, and width-to-depth ratio. The areas adjacent to streams and wetlands (RHCAs) were established in PACFISH to maintain the integrity of aquatic ecosystems. Healthy riparian areas are essential to maintaining or improving the quality of fish habitat in streams. This analysis will use a combination of DFC and RMO values to define existing conditions in watersheds where activities occur.

Direction in PACFISH specific to Timber Management/Silviculture includes the following:

PROHIBIT TIMBER HARVEST, INCLUDING FUEL WOODCUTTING, IN RHCAS, EXCEPT IN THE FOLLOWING CONDITIONS:

- Where catastrophic events such as fire, flooding, volcanic, wind, or insect damage result in degraded riparian conditions, allow salvage and fuel wood cutting in RHCAs only where present and future debris needs are met, where cutting would not retard or prevent attainment of RMOs, and where adverse effects on anadromous fish can be avoided.
- Apply silviculture practices for RHCAs to acquire desired vegetation characteristics where needed to attain RMOs. Apply silviculture practices is a manner that does not retard attainment of RMOs and that avoid adverse effects on listed anadromous fish.

Direction in PACFISH specific to Fire/Fuels Management and relevant to this project includes the following:

- Design fuel treatment and fire suppression strategies, practices, and actions so as not to prevent attainment of Riparian Management Objectives, and to minimize disturbance of riparian ground cover and vegetation.
- Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management actions could perpetuate or be damaging to long-term ecosystem function, listed anadromous fish, or designated critical habitat.

Direction in PACFISH specific to Recreation Management and relevant to this project includes the following:

- Design, construct, and operate recreation facilities, including trails and dispersed sites, in a manner that does not retard or prevent attainment of Riparian Management Objectives and avoids adverse effects on listed anadromous fish… Relocate or close recreation facilities where Riparian Management Objectives cannot be met or adverse effects on listed anadromous fish avoided.
- Adjust dispersed and developed recreation practices that retard or prevent attainment of RMOs or adversely affect listed anadromous fish. Where adjustment measures such as education, use limitations, traffic control devices, increased maintenance, relocation of facilities, and/or specific site closures are not effective in meeting RMOs and avoiding adverse effects on listed anadromous fish, eliminate the practice or occupancy.

Direction in PACFISH specific to Fisheries/Wildlife Restoration includes the following:

- Design and implement fish and wildlife habitat restoration and enhancement actions in a manner that contributes to attainment of RMOs.

CHANNEL MORPHOLOGY AND SEDIMENT ROUTING

Stream gradient is an important parameter that has implications for sediment transport and deposition. It is also related to fish habitat quality, since many species prefer lower gradient stream reaches for certain life stages. Lower gradient reaches on 3rd to 5th order streams in the project area are particularly well-suited for Chinook salmon and steelhead spawning. The data below were compiled with GIS methods using the 1:24,000 scale NHD stream layer and 30 meter DEM data.

TABLE B.3: PERCENT STREAM LENGTH BY GRADIENT CLASSES – AMERICAN RIVER

Watershed Name	Stream Miles	<2%	2-4%	4-10%	10-20%	20-40%	>40%
Middle American River[1]	12.8	45	12	34	9	0	0
East Fork American River[1]	19.6	12	12	28	39	9	0
Flint Creek	23.8	13	20	34	26	7	0
Whitaker Creek	4.6	6	2	46	33	12	0
Queen Creek	4.8	6	12	67	16	0	0
Box Sing Creek	4.1	11	6	36	46	0	0
Kirks Fork	26.8	8	8	37	35	11	1
Lower American River[1]	17.7	53	4	12	29	2	0

TABLE B.4: PERCENT STREAM LENGTH BY GRADIENT CLASSES – CROOKED RIVER

Watershed Name	Stream Miles	<2%	2-4%	4-10%	10-20%	20-40%	>40%
Middle Crooked River[2]	50.2	10	8	26	39	17	0
Relief Creek	23.2	14	5	36	34	11	0
Lower Crooked River[1]	40.0	20	2	15	39	21	4

SEDIMENT ROUTING

Sediment routing considers the disposition of sediment within the watershed system, including processes of erosion, deposition, storage and transport. It includes upslope and instream components. The upslope component includes initial detachment, erosion and delivery efficiency. The instream component includes suspended and bedload sediment yield, as well as substrate deposition and composition. The instream component also includes consideration of streamflow and channel morphology, both of which influence the capability of the stream to transport or deposit sediment.

[1] Data compiled for composite watersheds, not pure watersheds

[2] Data compiled for composite watersheds, not pure watersheds

EROSION AND DELIVERY PROCESSES

The erosion process initiates with detachment of material. Detachment can occur through weathering processes such as frost heave or raindrop impact. Erosion can occur as dry ravel, surface erosion (e.g. sheet, rill and gully) and mass erosion (e.g. debris avalanches, slumps and earthflows). The rate of each is dependent on climate, landforms, geology, soils and exposure of mineral soil. For freshly exposed materials, surface erosion is probably the dominant process in the Red River landscape. Transport occurs when rainfall or snowmelt generate water in sufficient quantities to carry the detached materials.

In most cases, a large proportion of eroded material is stored on the landscape without being delivered to the channel system. Storage can take place in hollows and flats or behind obstructions. It can also occur on slopes if the water transporting the material infiltrates. Delivery efficiency has been estimated for each landtype on the NPNF. Sediment is considered to be delivered to the channel system when it reaches a stream with defined bed and banks. Within the sediment model, this is assumed to occur at a catchment area of 1 mi^2 (USDA Forest Service, 1981).

INSTREAM PROCESSES

Once sediment is delivered to the channel system, it is subject to transport or deposition. Transport can occur as suspended or bedload sediment. Fine materials, such as clay, silt and fine sand are transported in the water column as suspended sediment. This material usually travels through the system rapidly and only deposits in still water. It contributes to the turbidity that is seen during runoff events. During active runoff periods the travel time of suspended sediment through the Red River watershed and out of the South Fork Clearwater River subbasin is less than 24 hours. Monitoring at gaging stations in nearby Red River has indicated that suspended sediment constitutes about 40 percent to 60 percent of the annual sediment yield (Gloss, 1995). Recent analyses with a larger dataset suggest that suspended sediment may be a higher proportion of total sediment yield.

Bedload sediment moves along the channel bottom and typically consists of medium and coarse sand, gravel and cobble. Boulders may occasionally move as bedload, but only for short distances in any given event. Bedload transport and deposition is a complex and intermittent process. It is highly dependent on stream energy in terms of streamflow and channel morphology. Under given conditions of streamflow, a river could transport or deposit bedload sediment in different reaches or habitat units, depending on gradient and cross-sectional characteristics. Bedload transport is an episodic process that occurs at higher streamflows, with the majority occurring at discharges approaching bankfull and above. Under low and moderate flow conditions, very little if any bedload is in transport.

Materials of various sizes are deposited between episodes of transport. Deposition can involve fines (i.e. sand) intruding into coarse substrates or covering the stream bottom. When large amounts of coarse substrates are deposited, aggradation and changes in bedforms can result. In some cases this can lead to further adjustments, such as bank erosion and changes in channel morphology. Storage of deposited sediment within a given habitat unit or reach may be relatively short, for example between flow events or seasons. In other cases, storage can be on the order of years to indefinitely.

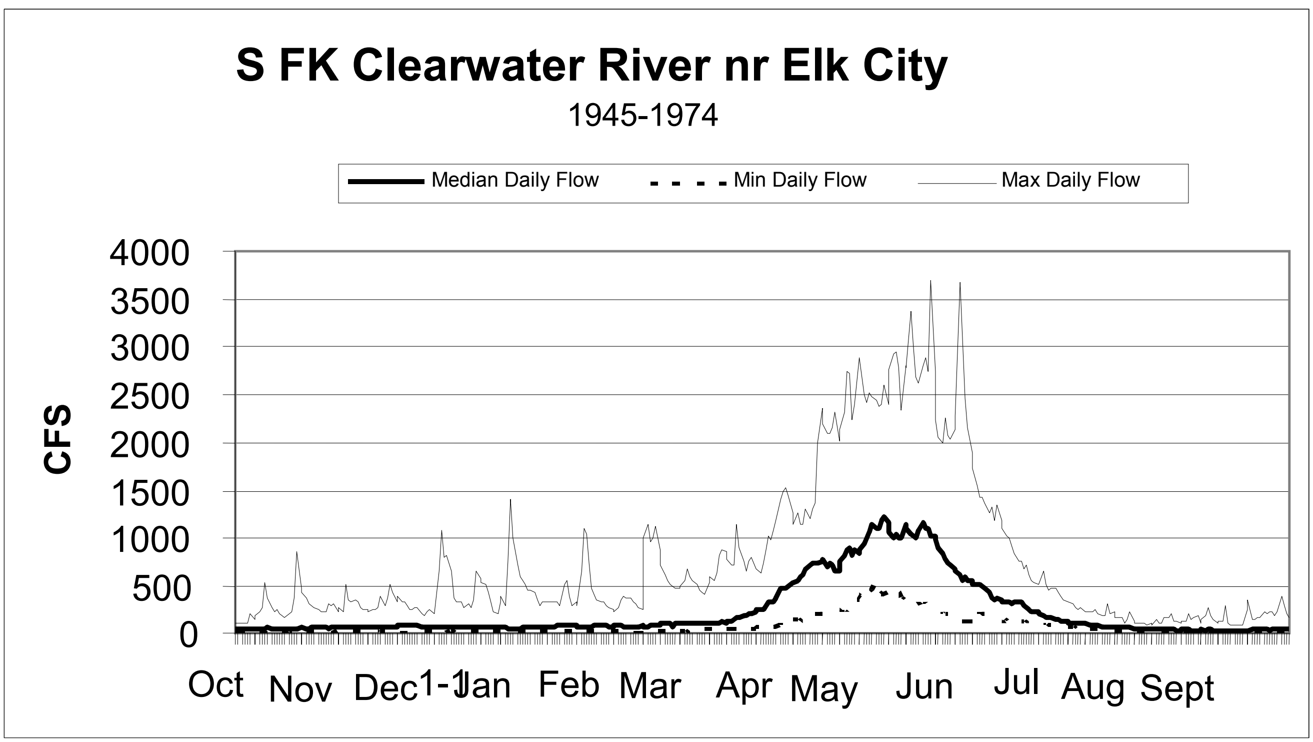
Stream gradients for the American and Crooked River watersheds are described above in Tables E.3 and E.4. Lower gradient reaches are particularly susceptible to sediment deposition and relatively long term storage. With regard to sediment deposition and transport, one classification system suggests that channels with <3 percent gradient can be considered response reaches and channels with >3 percent gradient can be considered either transport or source reaches (Montgomery and Buffington, 1993).

In subwatersheds affected by project activities in American River, Middle American and Lower American both have >45 percent of their channel system with gradient <2 percent. Conversely, the other subwatersheds all have >60 percent of their channel system with gradient >4 percent. In subwatersheds affected by project activities in Crooked River, all have >60 percent of their channel system with gradient >4 percent.

FLOW REGIME

The flow regime for American and Crooked Rivers is similar to the upper South Fork Clearwater River. The data represented below were collected by the USGS just upstream of the mouth of Crooked River. Though discontinued in 1974, this stream gage was re-established in 2002 and is currently in operation.

FIGURE B.3: ANNUAL HYDROGRAPH



AQUATIC MODEL DISCLOSURES

This section discloses the assumptions, limitations, management thresholds, and field tests associated with the three aquatic effects models used in the American and Crooked River project analysis. The models are Equivalent Clearcut Area (ECA), NEZSED, and FISHSED.

EQUIVALENT CLEARCUT AREA (ECA)

The ECA model procedures are derived from Forest Hydrology, Part II (USDA Forest Service, 1974). Equivalent Clearcut Area (ECA) analysis is a tool used to index the relationship between vegetation condition and water yield from forested watersheds. The basic assumptions of the procedure are that removal of forest vegetation results in water yield increases and that ECA can be used as an index of these increases. Depending on the interaction between water yield, sediment yield, and stream channel conditions, such increases could have impacts on stream channels.

Water yield increases can be directly modeled, but equivalent clearcut area (ECA) is often used as a surrogate. The ECA model is designed to estimate changes in mean annual streamflow resulting from forest practices or treatments (roading, timber harvest, and fires), which remove or reduce vegetative cover, and is usually expressed as a percent of watershed area (Belt, 1980). The index takes into account the initial percentage of crown removal and the recovery through regrowth of vegetation since the initial disturbance. For purposes of this assessment, ECA will be used to index changes in water yield through time based on timber harvest and roading disturbances.

There are a number of physical factors that determine the relationship between canopy conditions and water yield. These include interception, evapotranspiration, shading effects and wind flux. These factors affect the accumulation and melt rates of snow packs and how rainfall is processed. The ECA analysis takes into account the initial percentage of crown removal and the recovery through vegetative re-growth since the initial disturbance in the case of timber harvest or fire. Within the habitat types being treated under this project, the time frame for complete ECA recovery to occur is estimated to be 65 to 85 years (USDA Forest Service, 1974).

Additional factors affecting water yield include compacted surfaces due to roads, skid trails, and landings. Existing and new roads are considered as permanent openings in the ECA model. Decommissioned roads are considered as openings, so the road decommissioning projects do not contribute to reductions in ECA.

The ECA model does not directly account for the effects of peak flows. Peaks flows in the project area are nearly always associated with spring snowmelt, at times accompanied by rainfall. This can be seen in Figured E.3. Winter rain-on-snow events are historically rare and only infrequently exceed the spring runoff peak. About 3 percent of annual peak flow events have occurred during the winter months of November through March (USDA Forest Service, 1998). The effects of peaks flows are considered using professional judgment in the interpretation of ECA effects on stream channels.

Various ECA thresholds of concern have been in use in the Northern Region since the 1960s (Gerhardt, 2000). Early cutting guides recommended a limit of 20-30 percent

ECA within a watershed (Haupt, 1967). More recently, ECA thresholds have been rejuvenated through consultation under the Endangered Species Act. A recent Biological Opinion stipulated that watershed analysis should be conducted prior to actions that would increase ECA in 3rd to 5th order priority watersheds where ECA exceeds 15 percent (National Marine Fisheries Service, 1995).

Recently, concern over water yield changes relative to stream channel condition has focused on smaller headwater catchments. Research in the nearby Horse Creek watershed study have demonstrated instantaneous peak flow increase up to 34 percent and maximum daily flow increases up to 87 percent, resulting from road construction and timber harvest in small catchments (King, 1989). Recent observations have suggested that channel erosion from these streams may be contributing to increased bedload sediment in the 3^{rd} order receiving channel (Gerhardt, 2002).

The studies by Belt (1980) and King (1989) have also served as field tests of the ECA procedure. Belt concluded that the ECA procedure is a rational tool for evaluation of hydrologic impacts of forest practices. King recommended local calibration of the model and a greater emphasis on conditions in 1^{st} and 2^{nd} order headwater streams.

NEZSED

NEZSED is a computer model tiered to the R1R4 guidelines (Cline, et al, 1981), developed by hydrologists and soil scientists from the Intermountain Research Station and the Northern and Intermountain Regions of the Forest Service. The model estimates the average annual natural or base rate of sediment yield, and surface erosion sediment yield produced from roads, logging, and fire. The model is limited in that it does not consider the effects of activities on mass erosion greater than 10 cubic yards. It also does not include the effects of grazing and most instream and mining activities. Effects of land uses other than roads, logging and fire are analyzed using other information and techniques.

For this analysis, NEZSED was used to model timber harvest, temporary road construction, reconstruction of existing roads and road decommissioning. Activities under this project that are not modeled are soil restoration, trail improvements, recreation site improvements and stream channel restoration. The effects of these other activities were considered in the overall aquatic analysis and conclusions.

Though the model shows annual variations in response to land use, it does not estimate variations due to climate or weather events. NEZSED is not an event-based model in that sediment yield does not vary in accordance with specific assumed runoff or erosion events. It estimates average annual sediment yields. However, modeling coefficients are the result of a research base that includes the cumulative result of individual storm and runoff events. Thus, the effects of storm events are incorporated into the model coefficients, though the model results are expressed in terms of average annual yields.

Though NEZSED does not model large activity-related mass erosion events, effects of such events are considered in the effects analysis. This is done through mapping of landslide prone terrain and avoidance of areas deemed to possess high hazard and mitigation of areas deemed to possess moderate hazards. Mass erosion occurrences were also noted during field inventories.

Management thresholds for sediment yield were established in Appendix A of the Nez Perce National Forest Plan (USDA Forest Service, 1987). These include sediment yield guidelines, expressed as peak year percent over base sediment yield, and entry frequency guidelines, expressed as the number of times per decade that sediment yield guidelines can be equaled. For the American and Crooked River project, these guidelines are found in Tables E.1 and E.2.

NEZSED has been tested against field sampled data in several studies at three scales of watersheds across the Nez Perce National Forest (Gerhardt, 2005). The first study compared measured and modeled natural sediment yields at fifteen small watersheds that are tributaries to Horse Creek, which is a tributary of the Meadow Creek watershed draining into the Lower Selway Subbasin (Gerhardt and King, 1987). These watersheds ranged in size from 0.08 to 0.57 square miles. Annual sediment yield was sampled with sediment detention basins, suspended sediment samples, and streamflow gaging. Of the fifteen tributaries sampled, the model over-predicted sediment yield on nine sites and under-predicted on six sites. The mean result was that the model over-predicted by about 23 percent.

The second study evaluated data from eight stream gaging stations on the Nez Perce National Forest, ranging in size from 5.7 to 113 square miles. Three of these were located within the South Fork Clearwater Subbasin (Gloss, 1995). At six stations, the field data consisted of suspended and bedload sediment samples, along with streamflow gaging. At two stations, sediment yield was estimated through the use of sediment detention basins and streamflow gaging. This study found that NEZSED under-predicted sediment yields at six stations and over-predicted at two stations, when compared to observed data from field sampling during water years 1986 through 1993. For the three stations within the South Fork Clearwater Subbasin, field-sampled sediment yields averaged about 30 tons/mi²/yr. and modeled sediment yields averaged about 12 tons/mi²/yr. In general, the model predicted better in average to below average water years, and more significantly under-predicted in above average water years.

A third study to test the NEZSED model compared field sampled and modeled sediment yield at the subbasin scale, using data from the South Fork Clearwater and Selway Rivers. Sampling in both rivers occurred between 1988 and 1992 and consisted of 52 suspended sediment samples. The South Fork data were collected at the Mt. Idaho Bridge, near the forest boundary where the watershed area is about 830 square miles. When calculated as annual sediment yield, these data suggest an annual sediment yield at this site of 17,880 tons/year, or about 22 tons/mi²/yr. Sediment yield predictions at this site, based on NEZSED, were estimated to be 15,080 tons per year, or about 18 tons/mi²/yr (USDA Forest Service, 1998).

The Selway River data were collected at the USGS gage near Ohara Creek, where the watershed area is about 1910 square miles. When calculated as annual sediment yield, these data suggest a sediment yield at this site of 54,900 tons/year, or if adjusted to the mouth, 55,700 tons/year. The watershed area at the mouth is 1974 square miles, so the sediment production is 28 tons/mi² /yr. Sediment predictions based on modeled sediment at the mouth of the Selway River were 54,400 tons/year or about 27.5 tons/mi²/yr (USDA Forest Service, 2001).

A fourth study (Thomas and King, 2004) tested NEZSED against measured data at stream gages in Red River and South Fork Red River. Results showed that NEZSED predicted 74 percent and 89 percent, respectively, of field-sampled sediment yield over a 16-year period at these two gaging stations. The model results were closer to measured values at these two stations than found in the Gloss study.

FISHSED

The Guide for Predicting Salmonid Response to Sediment Yields in Idaho Batholith Watersheds (Fishsed model) has been used in this project to predict the effect of sediment yields on stream habitat and fish populations. This model is based on assumptions and has limitations.

The assumptions of the Fishsed model are listed in Appendix A of the model documentation (Stowell et al, 1983). Some of the key assumptions with influence on the limitations of this model include: 1) on those Forests in which mass erosion is a significant hazard, predicted sediment yield will include a mass erosion component. The American and Crooked River Project does not occur in a landscape where mass erosion is a significant hazard. 2) The relative response of salmonid fish populations to increased levels of sediment and percent fines in the substrate as depicted in laboratory studies approximates the response under natural conditions. The model documentation (p. 6) describes studies that support this assumption and others that show some differences.

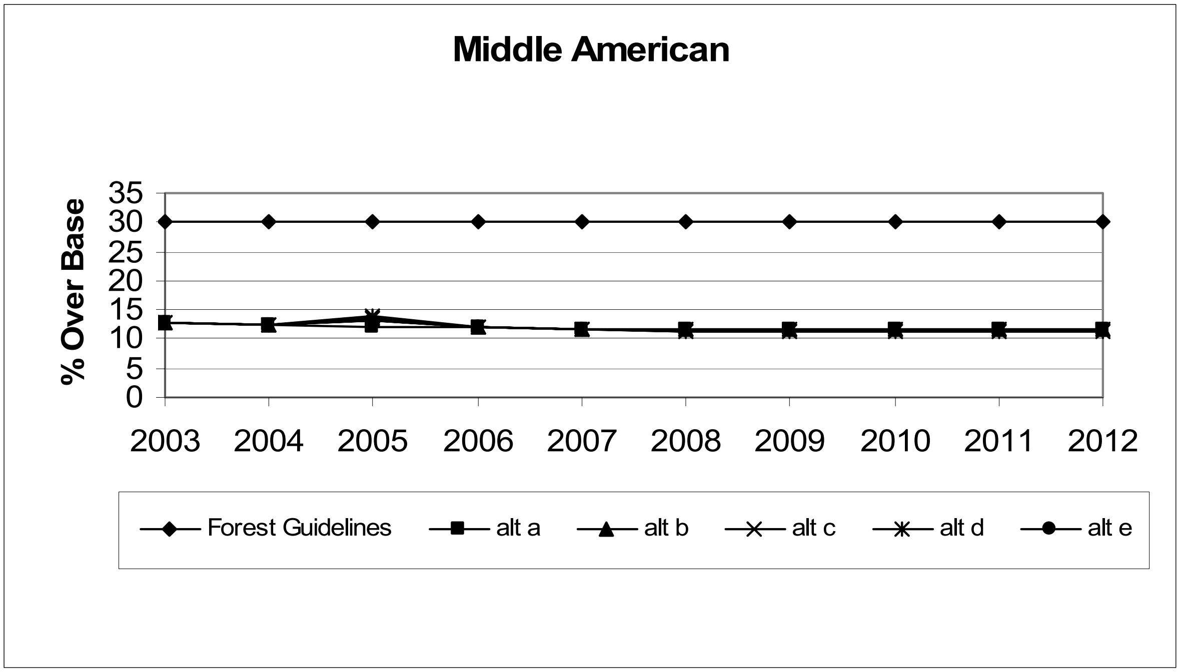
The Fishsed model has other recognized limitations including: 1) the model simplifies an extremely complex physical and biological system and is developed from limited scientific knowledge (p. 2). The complex sequence of sediment movement from the slopes to the channel, transport down, and deposition in a channel reach, and its effect on fish habitats and populations have not been fully described (p. 5). 2) The method was developed for watersheds and fish species associated with the Idaho Batholith (p. 4), using data from the Clearwater and Nez Perce National Forest. Given the source of the original data, the model is applicable to the American and Crooked River Project. 3) The specific fish response curves in this model were partially developed from laboratory experiments and may constitute only partial simulation of natural conditions (p. 6). 4) The model evaluates embryo survival, winter carrying capacity, and summer rearing capacity. While invertebrate insect abundance may be directly affected by sediment, the relationship between sediment deposition and invertebrate production is not included in the model (p.10). 5) The utilization of channel types to stratify fish response, particularly with respect to the modeling of “A” channel types, may not realistically represent changes in fish habitat (p. 21). 6) The model does not include a ‘recovery function’ that predicts the changes in substrate condition based on natural flow events. 7) The model was calibrated to the original Nez Perce Forest sediment model and landtypes, which have been updated since model development. No subsequent testing or validation of the model has occurred on the Forest. 8) The model outputs are reasonable estimates, but are not absolute numbers of high statistical precision (p. 6). As appropriate given this limitation, the model outputs have been used by the fisheries biologists in this project in combination with sound biological judgment.

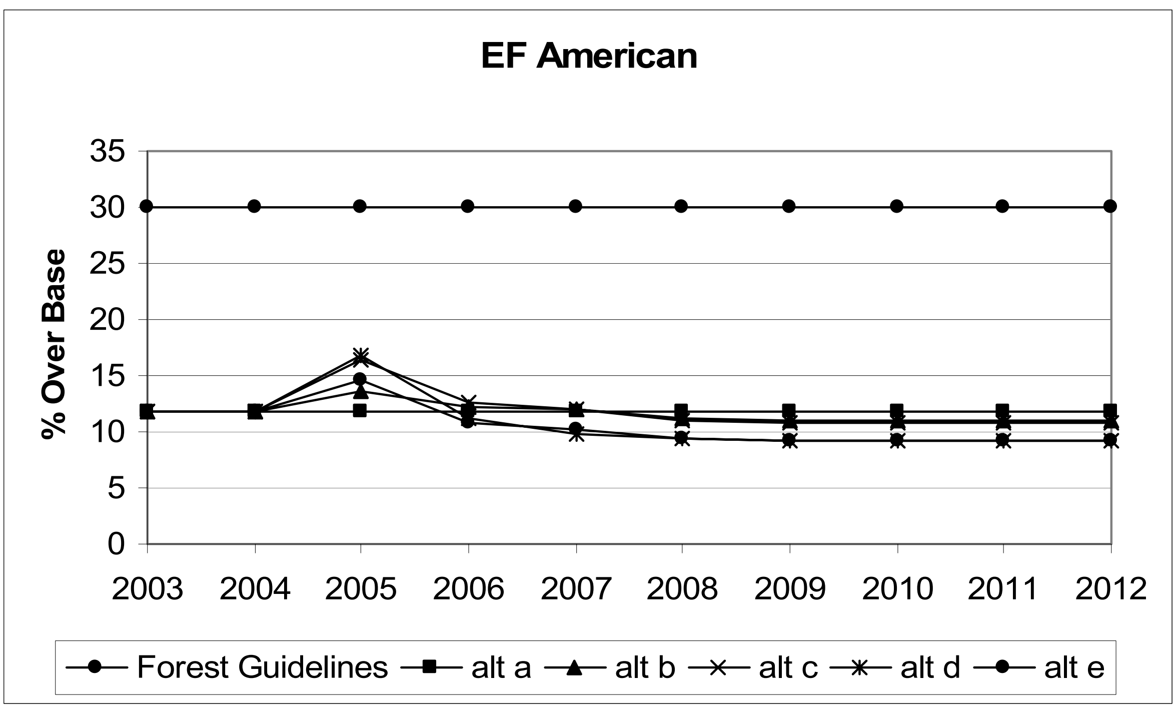
SEDIMENT YIELD GRAPHS

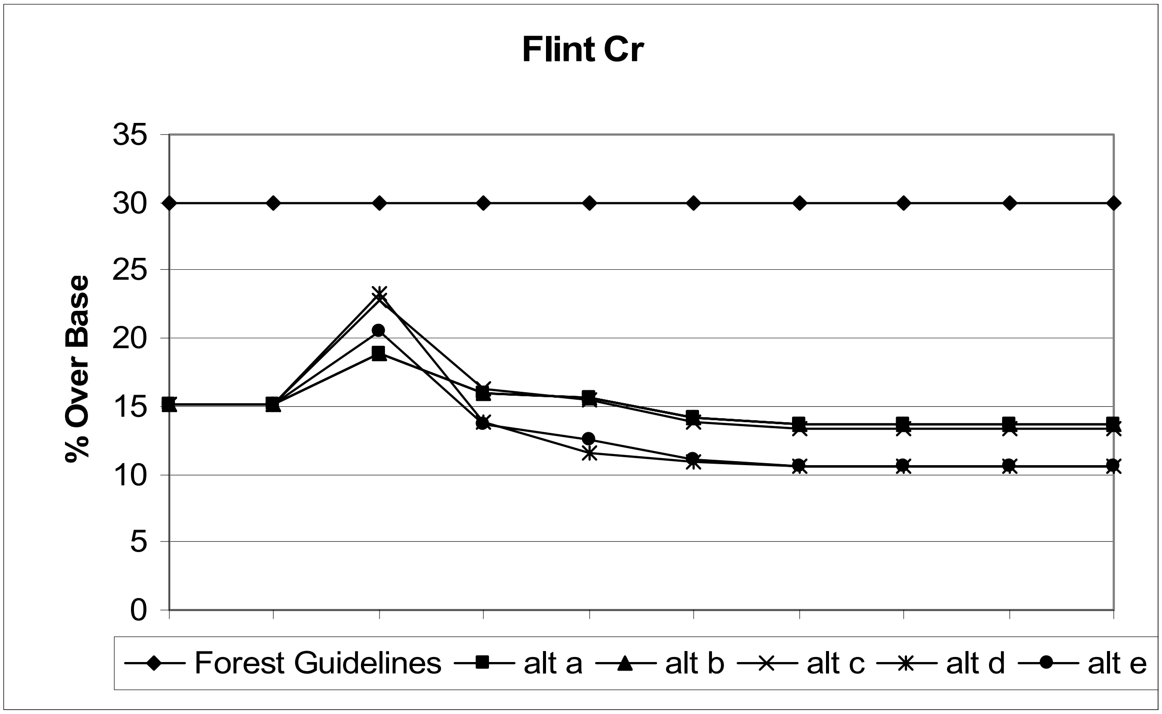
The following graphs show percent over base sediment yield by alternative for each analysis point in the American and Crooked River watersheds. These are the same data shown in tables in the Final Environmental Impact Statement, Section 3.2. – Watershed, except for the entire 10-year modeling period.

AMERICAN RIVER

FIGURES B.4A-H: SEDIMENT YIELD – AMERICAN RIVER






Flint Cr
35
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25
20
15
10
5
0
% Over Base
Forest Guidelines
alt a
alt b
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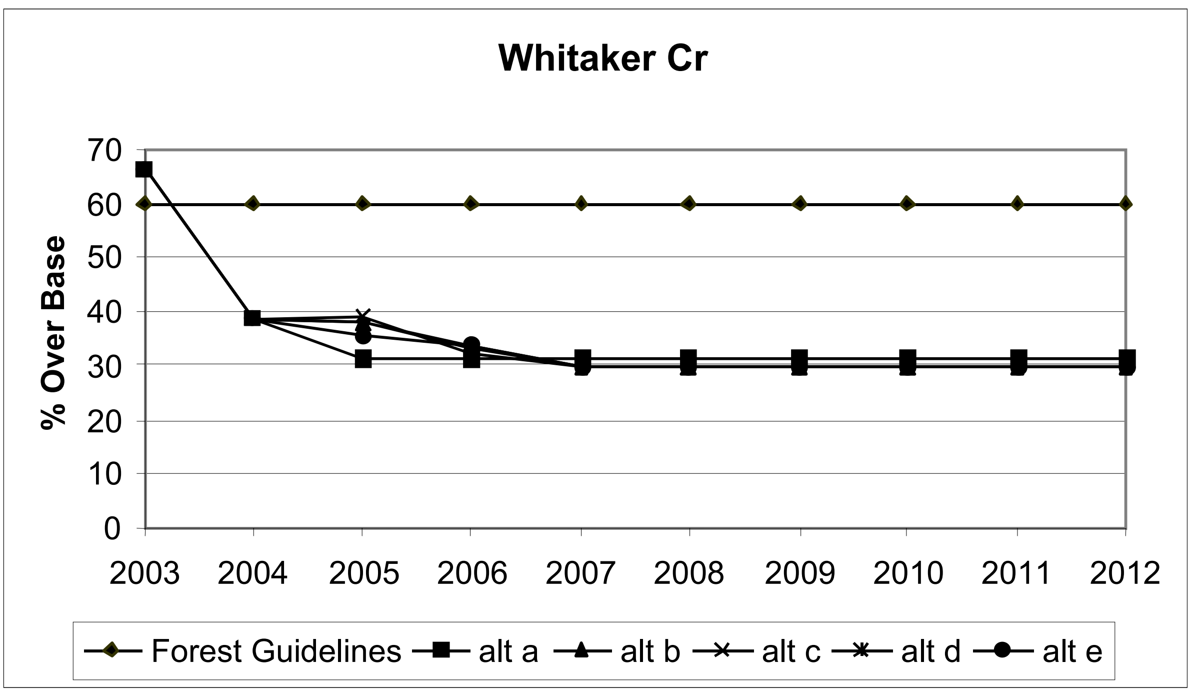
alt e


Whitaker Cr
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60
50
40
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10
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% Over Base
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Forest Guidelines
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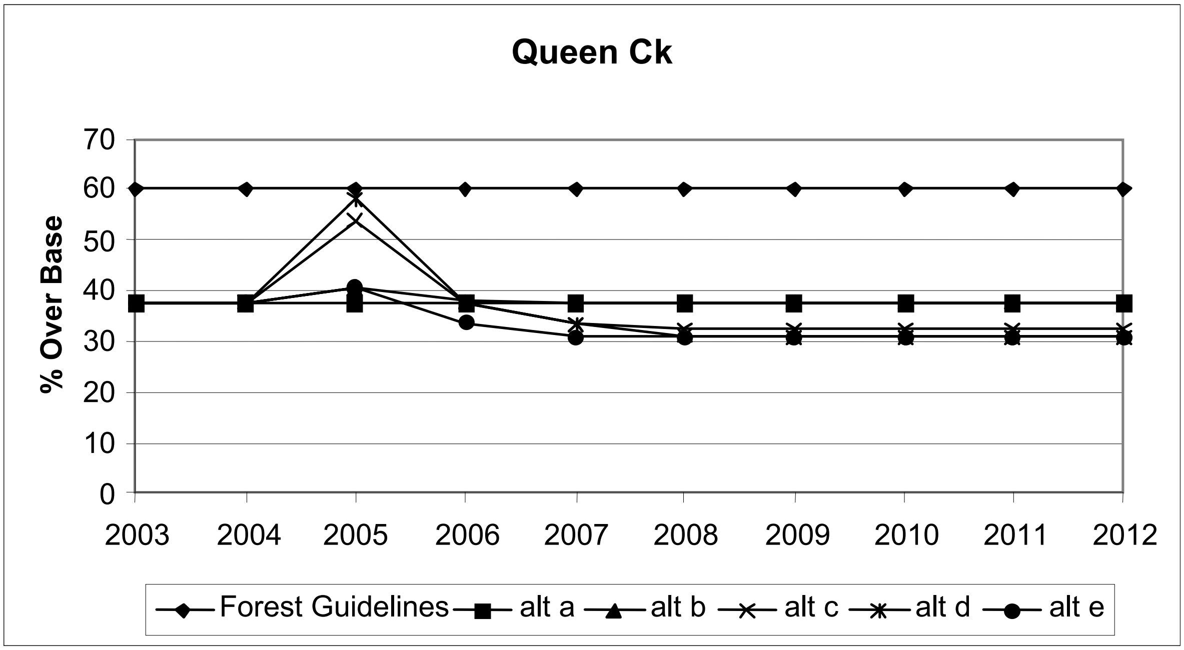
Queen Ck
% Over Base
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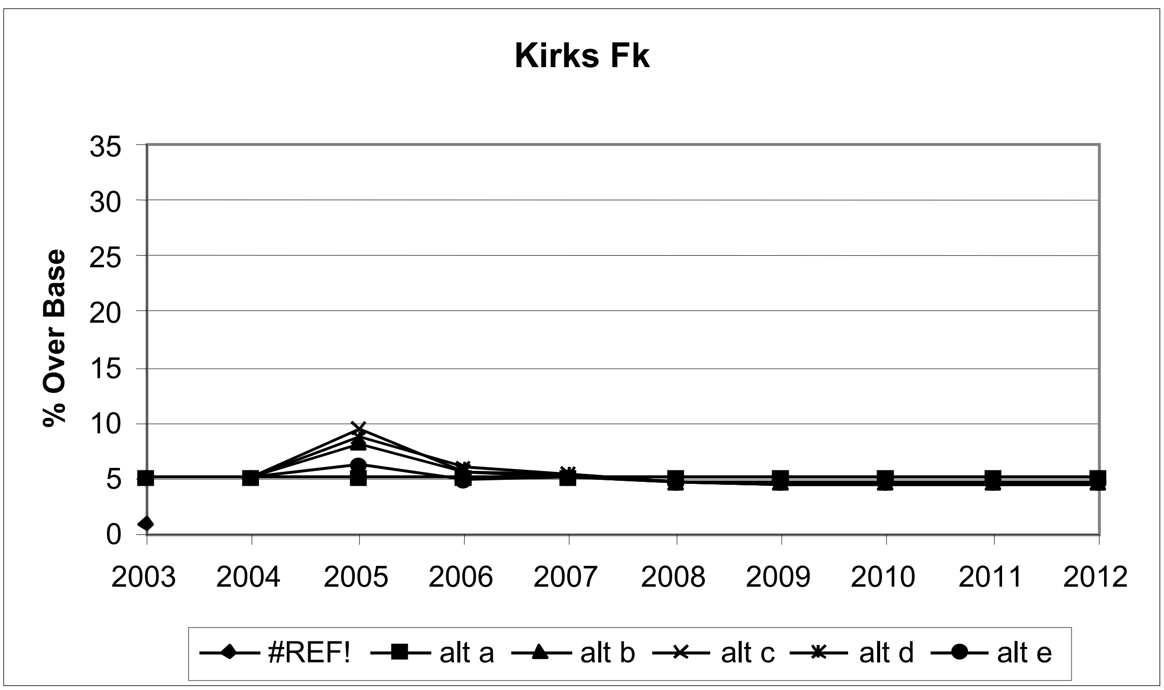
Kirks Fk
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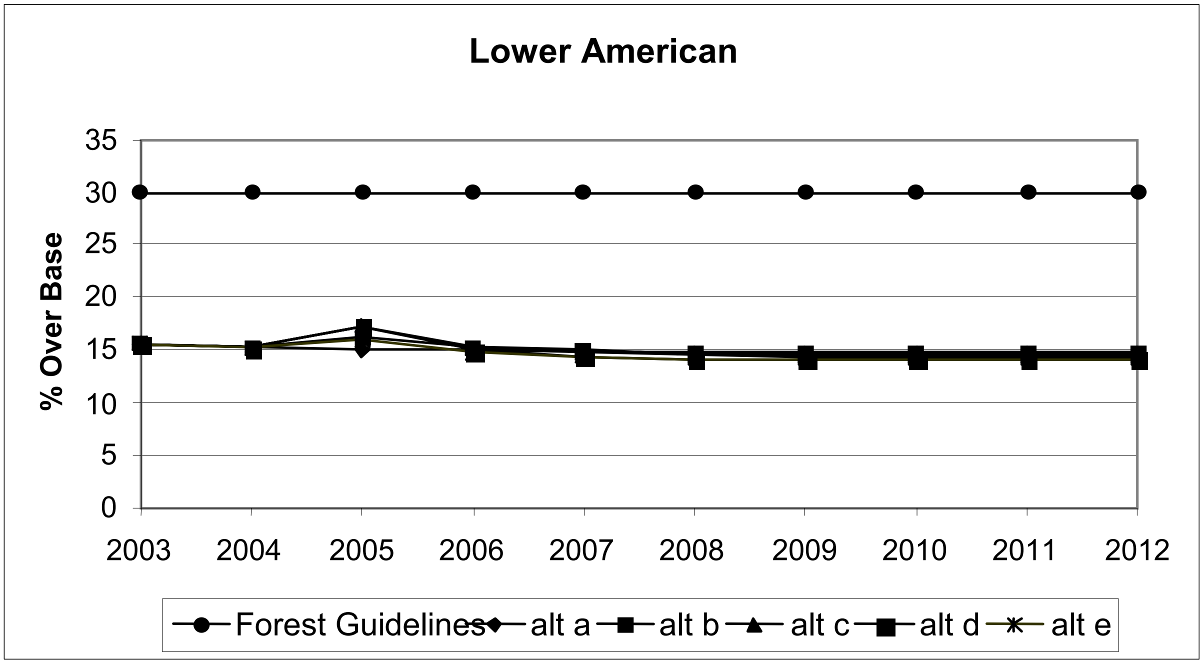
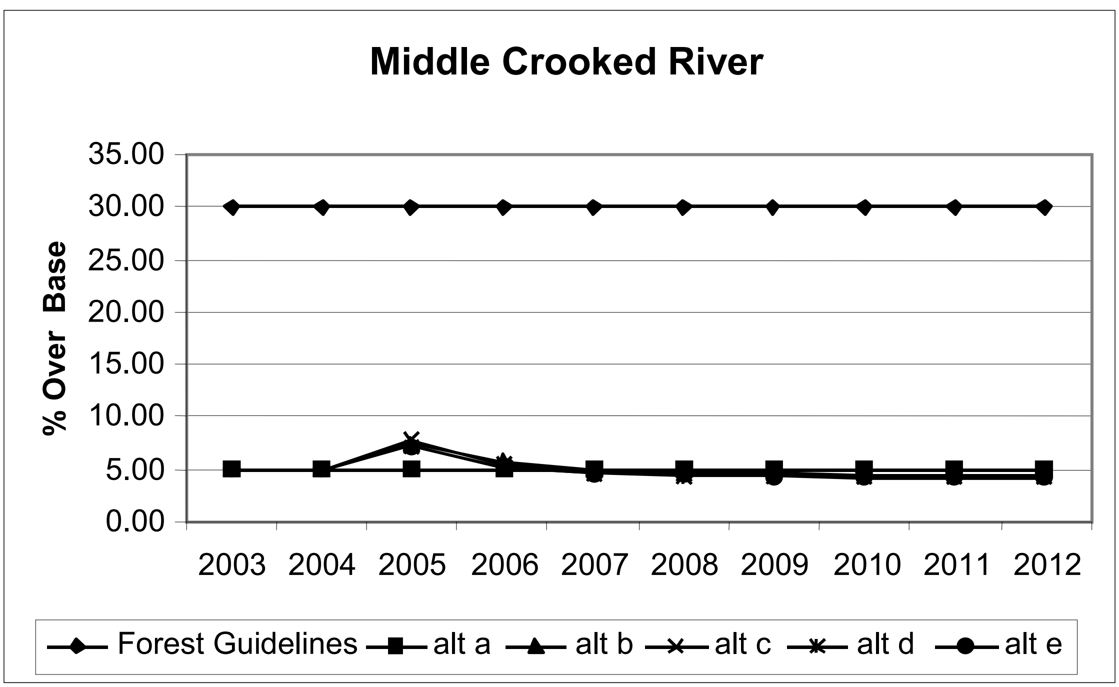
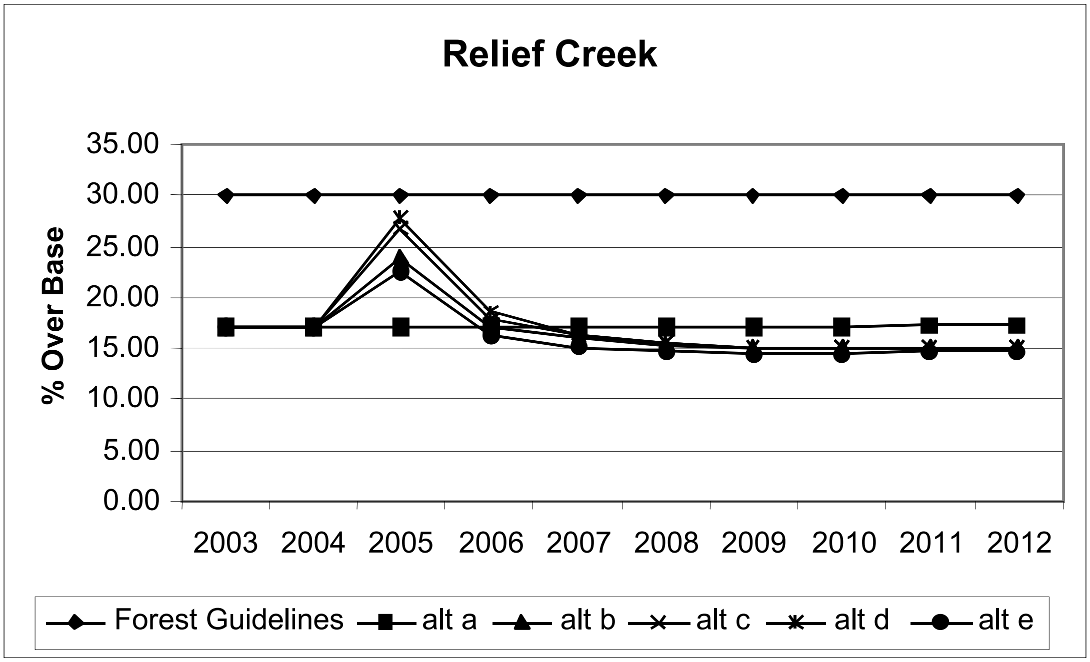
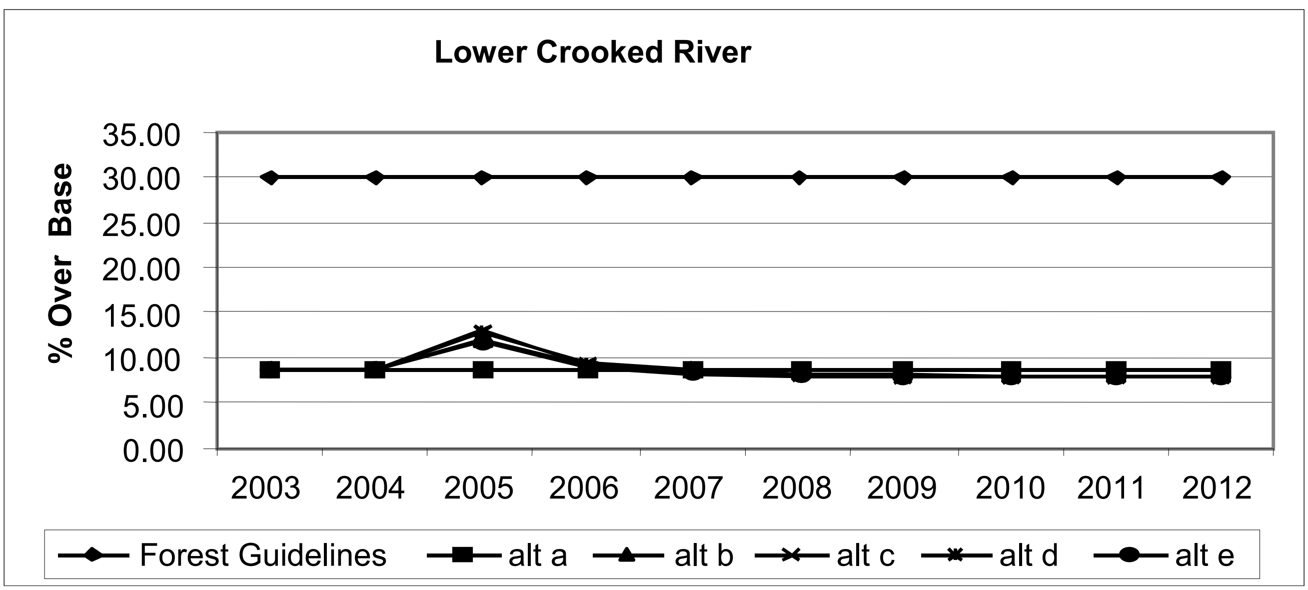


CROOKED RIVER

FIGURES B.5A-C: SEDIMENT YIELD – CROOKED RIVER



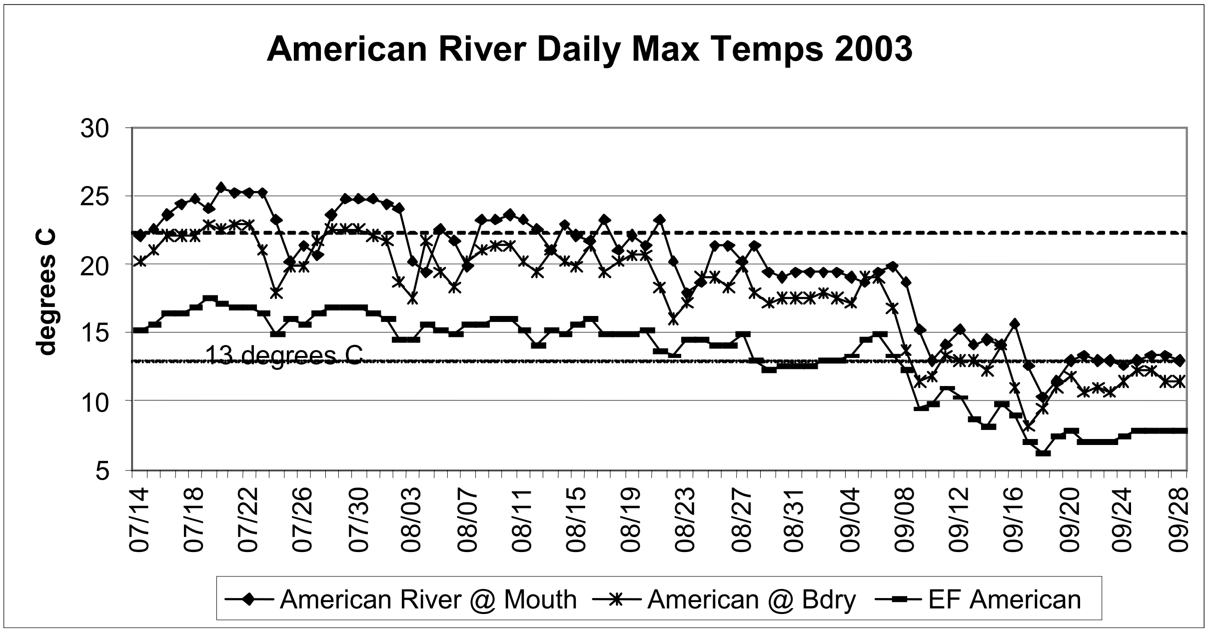


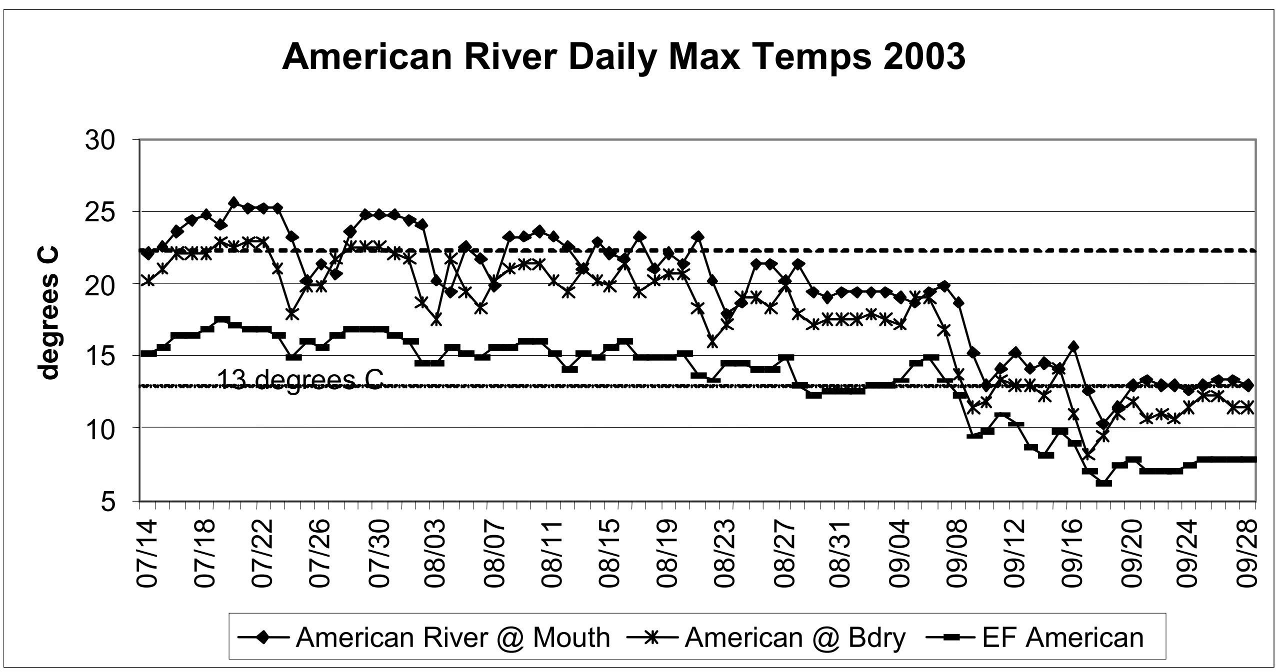


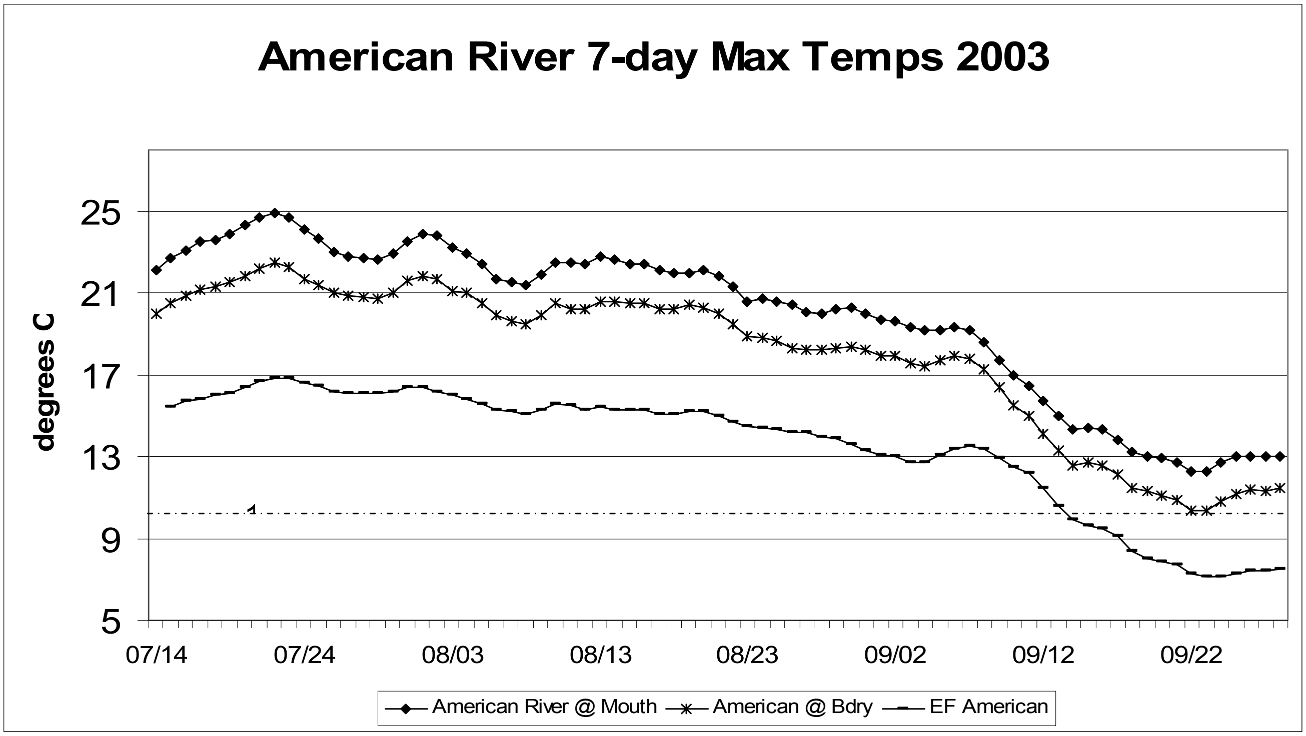
Water Temperature

Water temperature data were collected in the American/Crooked project watersheds during the summer of 2003. These data are shown in Figures B-7 and B-8. Data have been collected on the mainstem South Fork Clearwater River at the Mt. Idaho Bridge since 1993. These are summarized in Table B-5 to provide a perspective on the 2003 summer. It is apparent that 2003 was the warmest summer in the past 10 years in terms of water temperature in the South Fork Clearwater River subbasin.

FIGURE B.6A-D: AMERICAN RIVER 2003 WATER TEMPERATURE






American River 7-day Max Temps 2003
degrees C
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21
17
13
9
5
07/14
07/24
08/03
08/13
08/23
09/02
09/12
09/22
American River @ Mouth
American @ Bdry
EF American

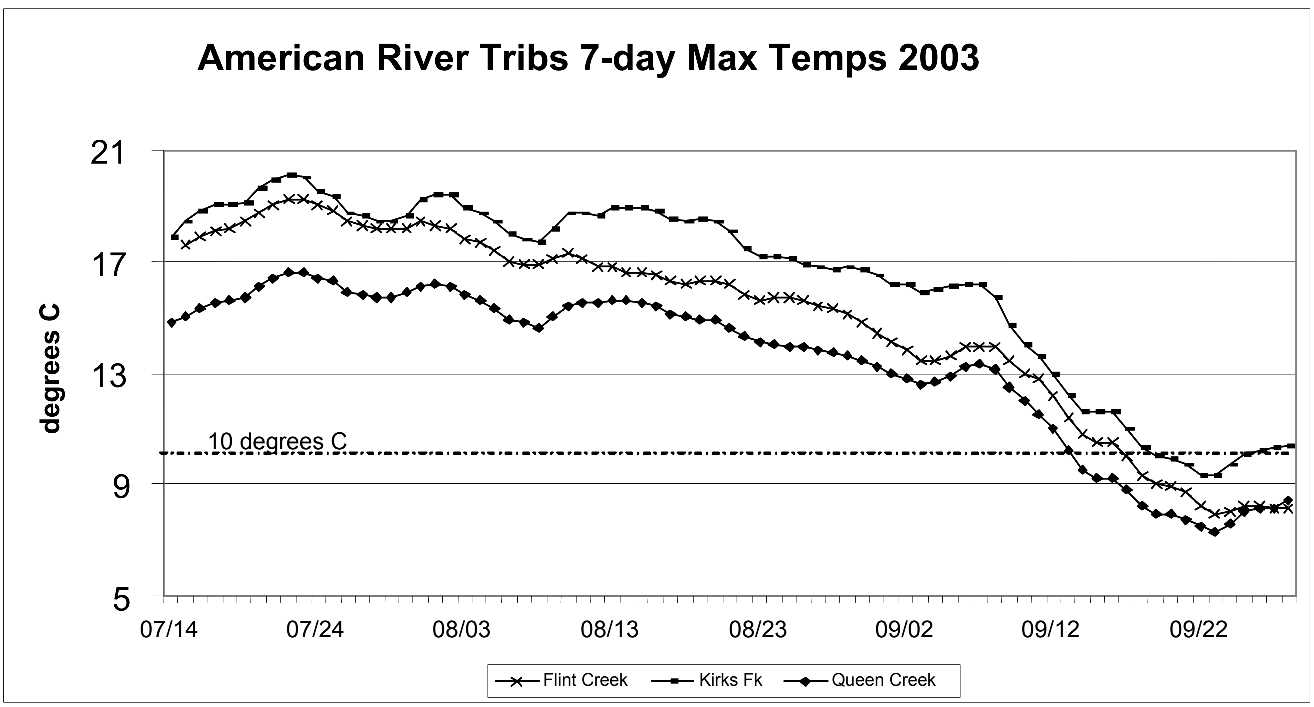
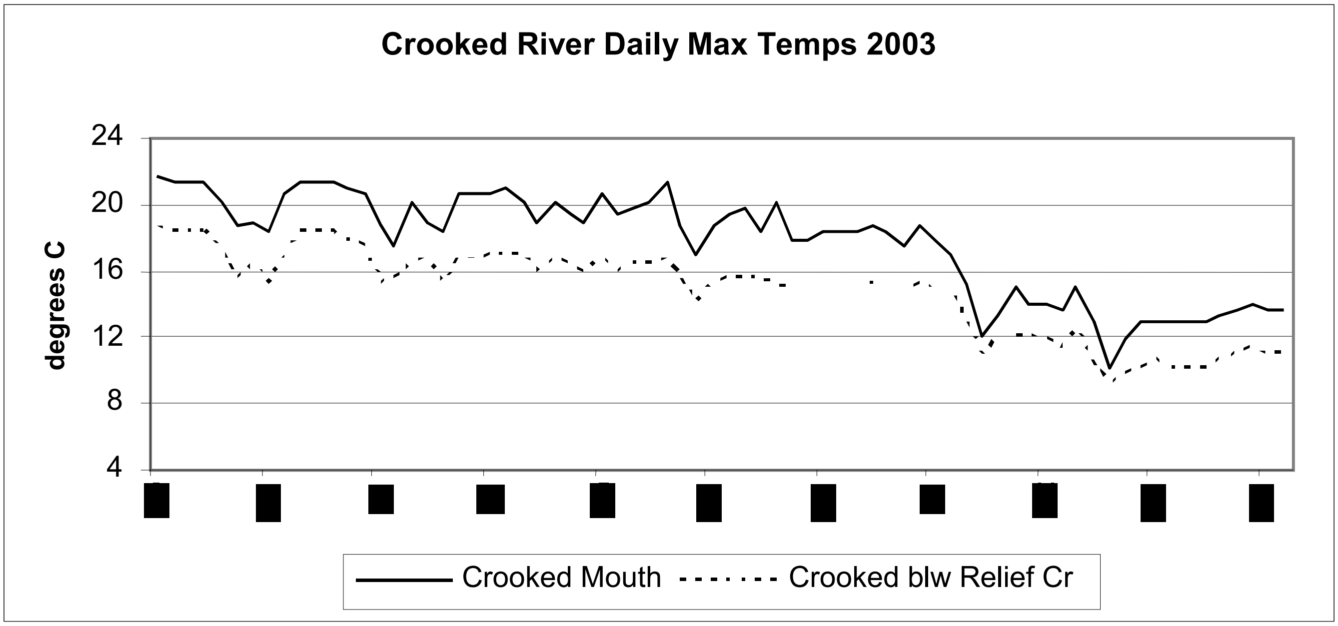
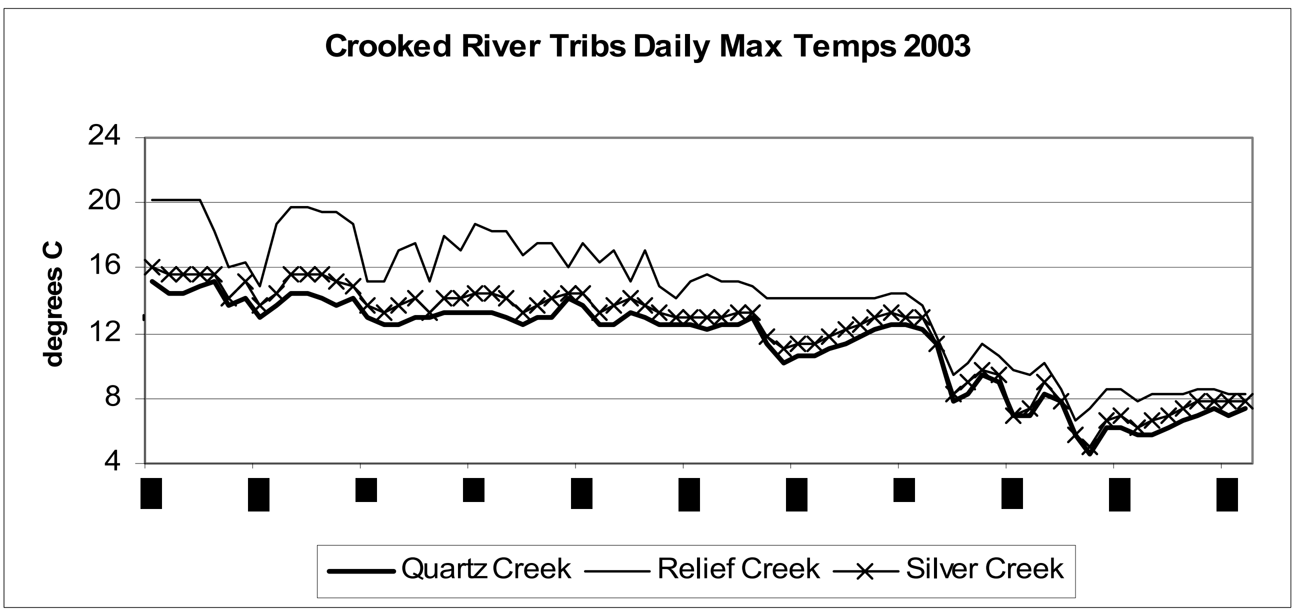
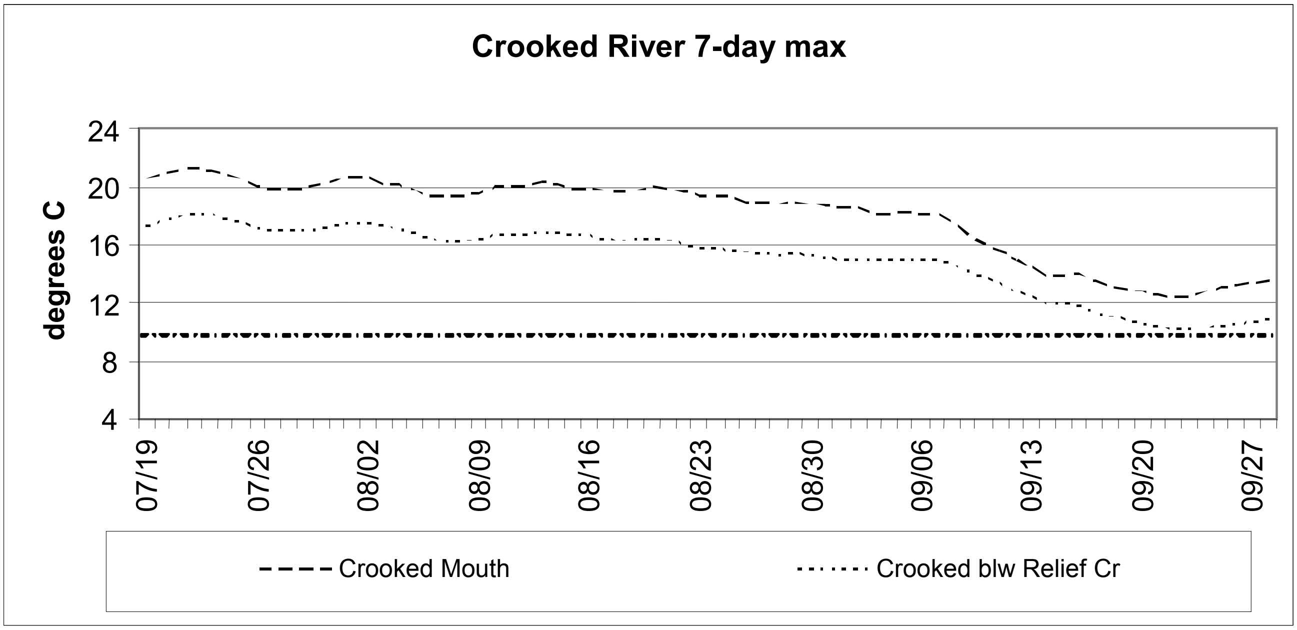
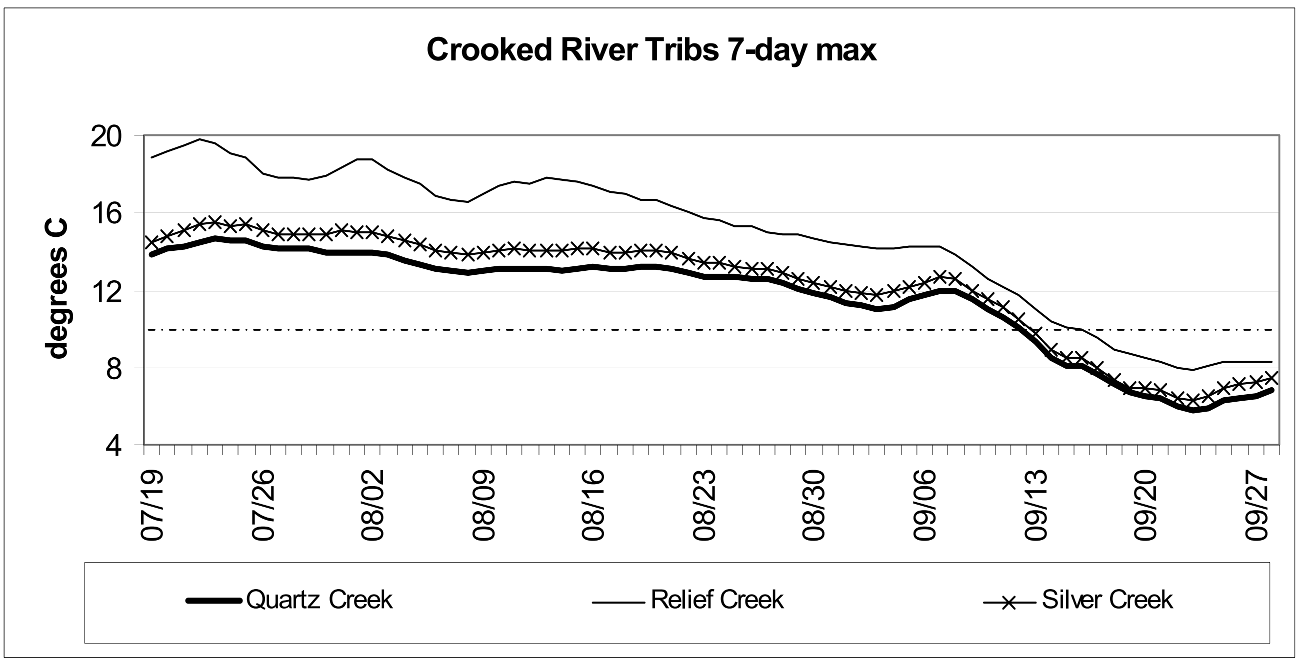

American River Tribs 7-day Max Temps 2003
degrees C
21
17
13
9
5
10 degrees C
07/14
07/24
08/03
08/13
08/23
09/02
09/12
09/22
Flint Creek
Kirks Fk
Queen Creek

FIGURE B.7A-D: CROOKED RIVER 2003 WATER TEMPERATURE









WATER QUALITY DATA

Water quality data were collected by the Nez Perce National Forest at several locations in the project area during the period of 1974 – 1981. These are useful for general characterization of water quality conditions. The lowest numbers of samples were taken for pH and the larger numbers of samples were taken for conductivity and alkalinity. Some key water quality parameters are summarized in the tables below:

TABLE B.5: WATER QUALITY DATA – AMERICAN RIVER

Site Name	STORET Number	Number of Samples	pH		Conductivity (µmhos)		Alkalinity (mg/l)	
			Mean	Range	Mean	Range	Mean	Range
Upper American	NEXY04	15-49	6.7	6.3-7.4	27	20-45	15	8-26
Flint Creek	NETW20	4-29	6.9	6.4-7.4	20	16-29	11	7-18
Lower American	NEXT05	5-37	6.8	6.8-6.8	22	18-33	12	6-21

TABLE B.6: WATER QUALITY DATA – CROOKED RIVER

Site Name	STORET Number	Number of Samples	pH		Conductivity (µmhos)		Alkalinity (mg/l)	
			Mean	Range	Mean	Range	Mean	Range
Crooked River	NETW0	12	NA	NA	21	12-31	NA	NA
Relief Creek	NETW10	24-50	7.1	6.2-8.0	22	10-34	14	10-21

Sampling in Crooked River was limited in the studies summarized above. A subsequent water quality study was conducted in 1986 and 1987. In four samples taken under this study, pH ranged from 7.3 to 7.5, conductivity ranged from 35 to 47 µmhos, and alkalinity ranged from 18 to 20 mg/l (Mann and Von Lindern, 1988).

AQUATIC TREND ANALYSIS

INTRODUCTION TO TREND ANALYSIS

To assess the expected trend in aquatic habitat condition, from the variety of influences both quantitative and qualitative, the activities and their expected contribution to aquatic condition are summarized in a table below. The table is a summary of the expected influence of the alternatives on the aquatic conditions in the American and Crooked River watersheds respectively. It does not represent an assessment of cumulative effects, or expected trend within specific subwatersheds. Various activities are considered with respect to the variety of aquatic processes that they potentially affect.

The contribution to the overall aquatic condition is estimated in terms of positive influence (denoted by "+") where the activity is expected to contribute to an improvement in condition, and a negative influence (denoted by "-") where the activity is expected to contribute to degradation in aquatic condition. The amount of influence a specific activity is expected to have on the overall aquatic condition (either positive or negative) is represented by a ranking of high (H), moderate (M), or low (L). Activities rated "High" are those that are expected to have a significant effect at the watershed scale (considering both scope and magnitude). Those rated as "Moderate" are those activities that are expected to have a significant local effect (i.e. at the subwatershed scale), but not result in a significant effect at the watershed scale. Those activities rated “Low” are expected to have only a negligible effect both at the subwatershed and watershed scale.

All of the processes potentially affected by an activity are listed in the table. No ranking represents ‘no expected’ influence on conditions from this project. The expected contribution of a specific activity on aquatic condition is considered both in terms of short-term and long-term. Short-term influence is judged to be the immediate results of implementing the activity, generally expected to be around a 5-year timeframe. Long-term influence is judged to be the influence the activity will have on aquatic condition as a result of changes in processes and resource conditions that will over time result in changes in aquatic habitat condition. The timeframe for this influence is greater than 5 years.

TREND ANALYSIS – AMERICAN RIVER

TABLE B.7: AQUATIC TREND ANALYSIS – AMERICAN RIVER

Action	Process Affected	Characteristic Indicator	Alt A Short Term	Alt A Long Term	Alt B Short Term	Alt B Long Term	Alt C Short Term	Alt C Long Term	Alt D Short Term Required Only	Alt D Long Term Required Only	Alt D Short Term Required + Additional	Alt D Long Term Required + Additional	Alt E Short Term	Alt E Long Term
Vegetation Treatments	Surface Erosion	Pulse & Chronic Sediment		-L	-L		-L		-L		-L			
	Mass Failure Risk	Pulse sediment												
	Infiltration, runoff, peaks	Hydrologic process		-L	-L		-L		-L		-L		-L	
	Solar heating	Riparian shade												
	LWD Recruitment	Potential LWD												
Temporary Road Construction	Surface erosion	Pulse & Chronic Sediment			-M		-M		-M		-M		-L	
	Mass failure risk	Pulse sediment												
	Infiltration, runoff, peaks	Hydrologic process			-L		-L		-L		-L			
	Fish passage	Habitat availability												
	Riparian shade	Riparian condition												
	LWD Recruitment	Potential LWD												

Action	Process Affected	Characteristic Indicator	Alt A Short Term	Alt A Long Term	Alt B Short Term	Alt B Long Term	Alt C Short Term	Alt C Long Term	Alt D Short Term Required Only	Alt D Long Term Required Only	Alt D Short Term Required + Additional	Alt D Long Term Required + Additional	Alt E Short Term	Alt E Long Term
Road Recon and Improvement	Surface erosion	Pulse & Chronic Sediment			-M		-M		-M		-M		-L	
	Mass failure risk	Pulse Sediment												
	Infiltration, runoff, peaks	Hydrologic process												
	Fish passage	Habitat availability												
Road Decommissioning	Surface erosion	Pulse & Chronic Sediment			-L	+L	-L	+L	-L	+L	-M	+M	-M	+M
	Mass failure risk	Pulse sediment												
	Infiltration, runoff, peaks	Hydrologic process			+L	+L	+L	+L	+L	+L	+M	+M	+M	+M
	Fish Passage	Habitat availability												
	Riparian Shade	Riparian Condition												
	LWD Recruitment	Potential LWD												
Stream Crossing Improvement	Surface erosion	Pulse & Chronic Sediment			-L		-L		-L		-L		-L	
	Mass failure risk	Pulse sediment												
	Infiltration, runoff, peaks	Hydrologic process			+L	+L	+L	+L	+L	+L	+M	+M	+M	+M
	Fish passage	Habitat availability			+L	+L	+L	+L	+L	+L	+M	+M	+M	+M
In-channel & Riparian Restoration	Construction sediment	Pulse & Chronic Sediment												
	Habitat Quality	Channel Dimensions												
	Riparian shade	Riparian Condition												
	LWD Recruitment	Acting LWD												

Action	Process Affected	Characteristic Indicator	Alt A Short Term	Alt A Long Term	Alt B Short Term	Alt B Long Term	Alt C Short Term	Alt C Long Term	Alt D Short Term Required Only	Alt D Long Term Required Only	Alt D Short Term Required + Additional	Alt D Long Term Required + Additional	Alt E Short Term	Alt E Long Term
Soil Restoration	Surface erosion	Pulse & chronic Sediment												
	Mass failure risk	Pulse sediment												
	Infiltration, runoff, peaks	Hydrologic process			+L	+L	+L	+L	+L	+L	+M	+M	+M	+M
	Riparian Shade	Riparian Condition												
Mine Site Reclamation	Surface Erosion	Pulse & Chronic Sediment												
	Infiltration, runoff, etc.	Hydrologic process												
	Riparian Interaction , shade	Riparian Conditions												
Rec & Trail Improvements	Surface Erosion	Pulse & Chronic Sediment			+L	+L	+L	+L	+L	+L	+L	+L	+L	+L
	Infiltration, Runoff, etc.	Hydrologic Processes												
	Riparian Interaction , Shade	Riparian Condition												

The expected short-term consequences of the American and Crooked River project on aquatic condition in American River are fairly balanced between positive and negative influences. The factors contributing to a short-term reduction in aquatic condition are principally related to the sediment pulse generated from the implementation of the action (timber harvest, temporary road construction, road decommissioning, road reconstruction and improvement, and culvert replacement. The temporary road construction is judged to be the largest contributor to this influence, followed by the harvest activities, road decommissioning, and road reconstruction and improvement. The factors contributing to an immediate short-term improvement in aquatic condition are related to; the reduction in chronic sediment and improvement in the hydrologic process from road decommissioning, road reconstruction and improvement, and soil restoration; and the immediate improvements in habitat accessibility from culvert upgrades and road decommissioning are judged to be the largest contributors to this improvement.

The expected long-term consequences of the American and Crooked River project on aquatic condition in the American River watershed are all positive. The road decommissioning and improved habitat accessibility from the culvert upgrades are judged to be the largest contributors to long-term improved aquatic conditions. The reduction in chronic sediment and improved hydrologic process from the road decommissioning, road improvement, and soil restoration are the other contributors to this expected improvement. The amount of the improvement associated with this later group of activities is rated low due to the amount of this work being completed with this project with respect to the remaining amount of degraded mainstem habitat, roads and compacted soils in the American River watershed. These will continue to contribute negatively to these aquatic processes. Planned Bureau of Land Management work in this drainage will further improve in channel and riparian conditions along the mainstem as well as tributary streams.

The above ratings by activity can be summarized by the effect pathways by assigning a value to the Low, Moderate, and High ranking (L=1, M=2, H=3). The table below summarizes the alternatives by the effect pathway and for the alternative in general (total).

TABLE E 8: AQUATIC TREND SUMMARY – AMERICAN RIVER

Action	Process Affected	Characteristic Indicator	Alt A Short Term	Alt A Long Term	Alt B Short Term	Alt B Long Term	Alt C Short Term	Alt C Long Term	Alt D Short Term Required Only	Alt D Long Term Required Only	Alt d Short Term Required + Additional	Alt D Long Term Required + Additional	Alt E Short Term	Alt E Long Term
Summary	Surface Erosion	Pulse & Chronic Sediment	0	-1	-6	2	-6	2	-6	2	-7	3	-4	3
	Mass Failure Risk	Pulse sediment	0	0	0	0	0	0	0	0	0	0	0	0
	Infiltration, runoff, peaks	Hydrologic process	0	-1	1	3	1	3	1	3	4	6	5	6
	Riparian Shade	Riparian shade	0	0	0	0	0	0	0	0	0	0	0	0
	LWD Recruitment	Acting LWD	0	0	0	0	0	0	0	0	0	0	0	0
	Fish passage	Habitat availability	0	0	1	1	1	1	1	1	2	2	2	2
	Habitat Quality	Channel Dimensions	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL			0	-2	-4	6	-4	6	-4	6	-1	11	3	11

The No Action alternative in American River suggests no change in the short term, but a slight negative trend in the long term related to fire risk associated with untreated stands. Alternatives B, C, and D (the latter with only required improvement projects) suggest a short term negative effect, followed by long term improving trend. Alternative D, including the required and additional improvement projects, suggests a slight short-term negative effect, followed by a greater long term improving trend than the previous action alternatives. Alternative E suggests a slight short term improvement, followed by a similar long term improving trend as Alternative D, when both required and additional improvement projects are considered. The larger amount of improving trend in Alternatives D and E occur in large part as a result of the greater amount of road decommissioning, when both required and additional projects are considered.

TREND ANALYSIS – CROOKED RIVER

TABLE B.9: AQUATIC TREND ANALYSIS – CROOKED RIVER

Action	Process Affected	Characteristic Indicator	Alt A Short Term	Alt A Long Term	Alt B Short Term	Alt B Long Term	Alt C Short Term	Alt C Long Term	Alt D Short Term Required Only	Alt D Long Term Required Only	Alt d Short Term Required + Additional	Alt D Long Term Required + Additional	Alt E Short Term	Alt E Long Term
Vegetation Treatments	Surface Erosion	Pulse & Chronic Sediment		-L	-M		-M		-M		-M		-M	
	Mass Failure Risk	Pulse sediment												
	Infiltration, runoff, peaks	Hydrologic process		-L	-L		-L		-L		-L		-L	
	Solar heating	Riparian shade												
	LWD Recruitment	Potential LWD												
Temporary Road Construction	Surface erosion	Pulse & Chronic Sediment			-M		-M		-M		-M		-M	
	Mass failure risk	Pulse sediment												
	Infiltration, runoff, peaks	Hydrologic process			-L		-L		-L		-M		-L	
	Fish passage	Habitat availability												
	Riparian shade	Riparian condition												
	LWD Recruitment	Potential LWD												
Road Recon and Improvement	Surface erosion	Pulse & Chronic Sediment			-M		-M		-M		-M		-M	
	Mass failure risk	Pulse Sediment												
	Infiltration, runoff, peaks	Hydrologic process												
	Fish passage	Habitat availability												

Action	Process Affected	Characteristic Indicator	Alt A Short Term	Alt A Long Term	Alt B Short Term	Alt B Long Term	Alt C Short Term	Alt C Long Term	Alt D Short Term Required Only	Alt D Long Term Required Only	Alt d Short Term Required + Additional	Alt D Long Term Required + Additional	Alt E Short Term	Alt E Long Term
Road Decommissioning	Surface erosion	Pulse & Chronic Sediment		-L	-L	+L	-L	+L	-L	+L	-M	+M	-M	+M
	Mass failure risk	Pulse sediment										+L		+L
	Infiltration, runoff, peaks	Hydrologic process		-L	+L	+L	+L	+L	+L	+L	+M	+M	+M	+M
	Fish Passage	Habitat availability												
	Riparian Shade	Riparian Condition												
	LWD Recruitment	Potential LWD												
Stream Crossing Improvement	Surface erosion	Pulse & Chronic Sediment			-L		-L		-L		-M		-M	
	Mass failure risk	Pulse sediment												
	Infiltration, runoff, peaks	Hydrologic process			+L	+L	+L	+L	+L	+L	+M	+M	+M	+M
	Fish passage	Habitat availability			+L	+L	+L	+L	+L	+L	+M	+M	+M	+M
In-channel & Riparian Restoration	Construction sediment	Pulse & Chronic Sediment			-L		-L		-L		-M		-M	
	Habitat Quality	Channel Dimensions	-L	-L	+M	+M	+M	+M	+M	+M	+H	+H	+H	+H
	Riparian shade	Riparian Condition				+L		+L		+L		+M		+M
	LWD Recruitment	Acting LWD			+M	+M	+M	+M	+M	+M	+H	+H	+H	+H
Soil Restoration	Surface erosion	Pulse & chronic Sediment												
	Mass failure risk	Pulse sediment												
	Infiltration, runoff, peaks	Hydrologic process			+L	+L	+L	+L	+L	+L	+M	+M	+M	+M
	Riparian Shade	Riparian Condition												

Action	Process Affected	Characteristic Indicator	Alt A Short Term	Alt A Long Term	Alt B Short Term	Alt B Long Term	Alt C Short Term	Alt C Long Term	Alt D Short Term Required Only	Alt D Long Term Required Only	Alt d Short Term Required + Additional	Alt D Long Term Required + Additional	Alt E Short Term	Alt E Long Term
Mine Site Reclamation	Surface Erosion	Pulse & Chronic Sediment			-L		-L		-L		-L		-L	
	Infiltration, runoff, etc.	Hydrologic process			+L	+L	+L	+L	+L	+L	+L	+L	+L	+L
	Riparian Interaction, shade	Riparian Conditions				+L		+L		+L		+L		+L
Rec & Trail Improvements	Surface Erosion	Pulse & Chronic Sediment			+L	+L	+L	+L	+L	+L	+L	+L	+L	+L
	Infiltration, Runoff, etc.	Hydrologic Processes			+L	+L	+L	+L	+L	+L	+L	+L	+L	+L
	Riparian Interaction, Shade	Riparian Condition												

The expected short-term consequences of the American and Crooked River project on aquatic condition in the Crooked River watershed is fairly balanced between positive and negative influences. The factors contributing to a short-term reduction in aquatic condition are principally related to the sediment pulse generated from the implementation of the action (timber harvest, temp road construction, road decommissioning, road reconstruction and improvement, soil restoration, and in-channel aquatic improvements). The temporary road construction is judged to be the largest contributor to this influence, followed by the harvest activities, road decommissioning, and road reconstruction and improvement. The factors contributing to an immediate short-term improvement in aquatic condition are related to: the reduction in chronic sediment and improvement in the hydrologic process from road decommissioning, road reconstruction and improvement, and soil restoration; and the immediate improvements in habitat accessibility and riparian and instream conditions from the direct improvement projects (culvert upgrades, riparian planting, and in channel improvements). The in channel and riparian restoration are judged to be the largest contributor to this improvement, followed by the road decommissioning, culvert upgrades, soil restoration, recreation site and mine site improvements.

The expected long-term consequences of the American and Crooked River project on aquatic condition in the Crooked River watershed are all positive. The in channel habitat and riparian restoration work is judged to be the largest contributor to long-term improved aquatic conditions. The reduction in chronic sediment and improved hydrologic process from the road decommissioning, road improvement, culvert upgrades, soil restoration, and mine and recreation site improvements are the other contributors to this expected improvement. The amount of the in channel and riparian work will contribute correspondingly to the degree of long-term improvement in Crooked River.

The above ratings by activity can be summarized by the effect pathways by assigning a value to the Low, Moderate, and High ranking (L=1, M=2, H=3). The table below summarizes the alternatives by the effect pathway and for the alternative in general (total).

TABLE B.10: AQUATIC TREND SUMMARY – CROOKED RIVER

Action	Process Affected	Characteristic Indicator	Alt A Short Term	Alt A Long Term	Alt B Short Term	Alt B Long Term	Alt C Short Term	Alt C Long Term	Alt D Short Term Required Only	Alt D Long Term Required Only	Alt d Short Term Required + Additional	Alt D Long Term Required + Additional	Alt E Short Term	Alt E Long Term
Summary	Surface Erosion	Pulse & Chronic Sediment	0	-1	-9	2	-9	2	-9	2	-12	3	-12	3
	Mass Failure Risk	Pulse sediment	0	0	0	0	0	0	0	0	0	1	0	1
	Infiltration, runoff, peaks	Hydrologic process	0	-1	3	5	3	5	3	5	6	8	6	8
	Riparian Shade	Riparian shade	0	0	0	2	0	2	0	2	0	3	0	3
	LWD Recruitment	Acting LWD	0	0	2	2	2	2	2	2	3	3	3	3
	Fish passage	Habitat availability	0	0	1	1	1	1	1	1	2	2	2	2
	Habitat Quality	Channel Dimensions	-1	-1	2	2	2	2	2	2	3	3	3	3
TOTAL			-1	-3	-1	14	-1	14	-1	14	2	23	2	23

The No Action alternative in Crooked River suggests a slight negative effect in the short term related to ongoing maintenance needs at instream structures and a slight negative trend in the long term related to fire risk associated with untreated stands. Alternatives B, C, and D (the latter with only required improvement projects considered) suggest a short term negative effect, followed by long term improving trend. Alternatives D (including the required and additional improvement projects) and E suggest a slight short-term positive effect, followed by a greater long term improving trend than the previous action alternatives. The larger amount of improving trend in Alternatives D and E occur in large part as a result of the greater amount of road decommissioning and instream improvements, when both required and additional projects are considered.

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